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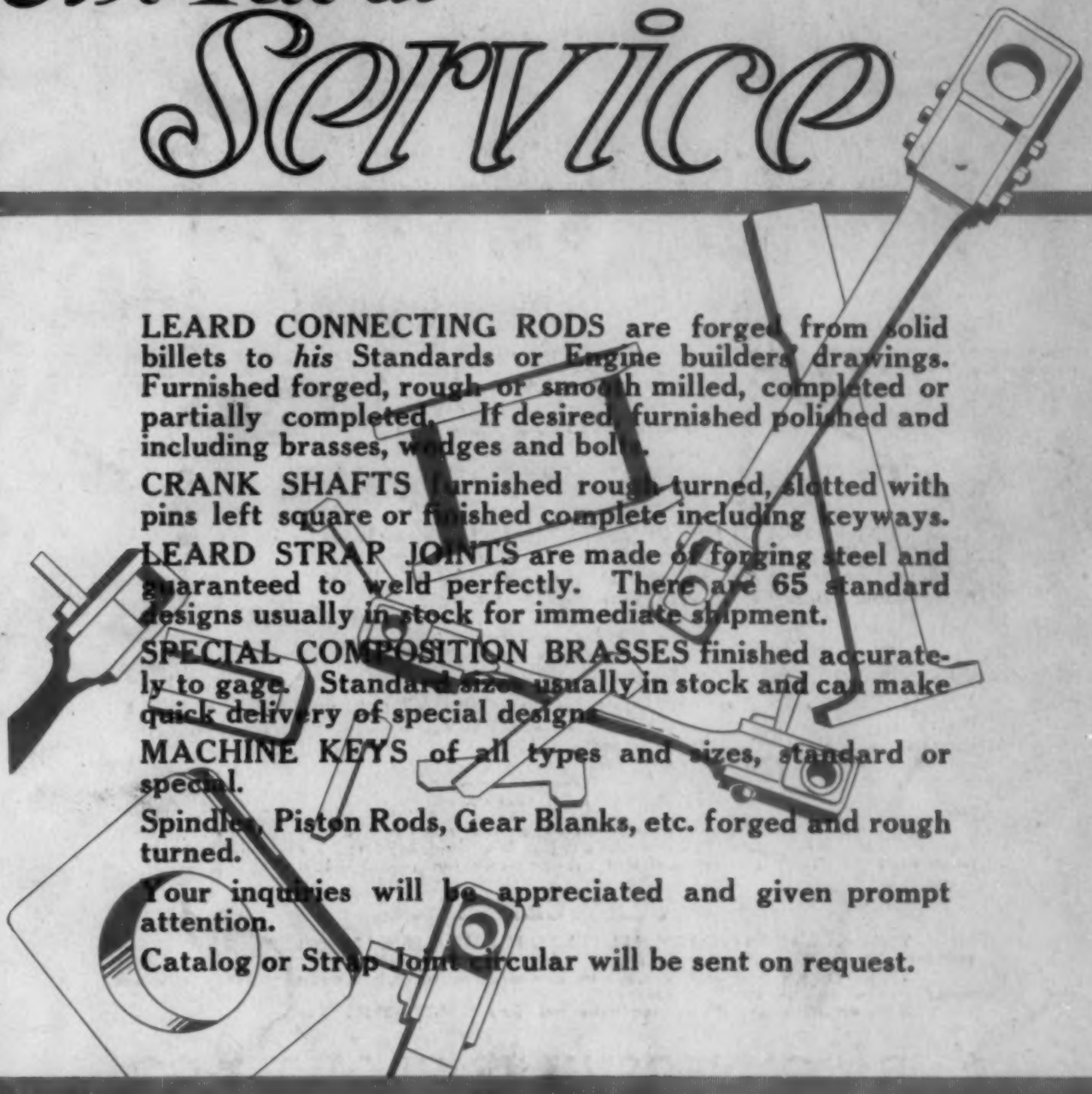

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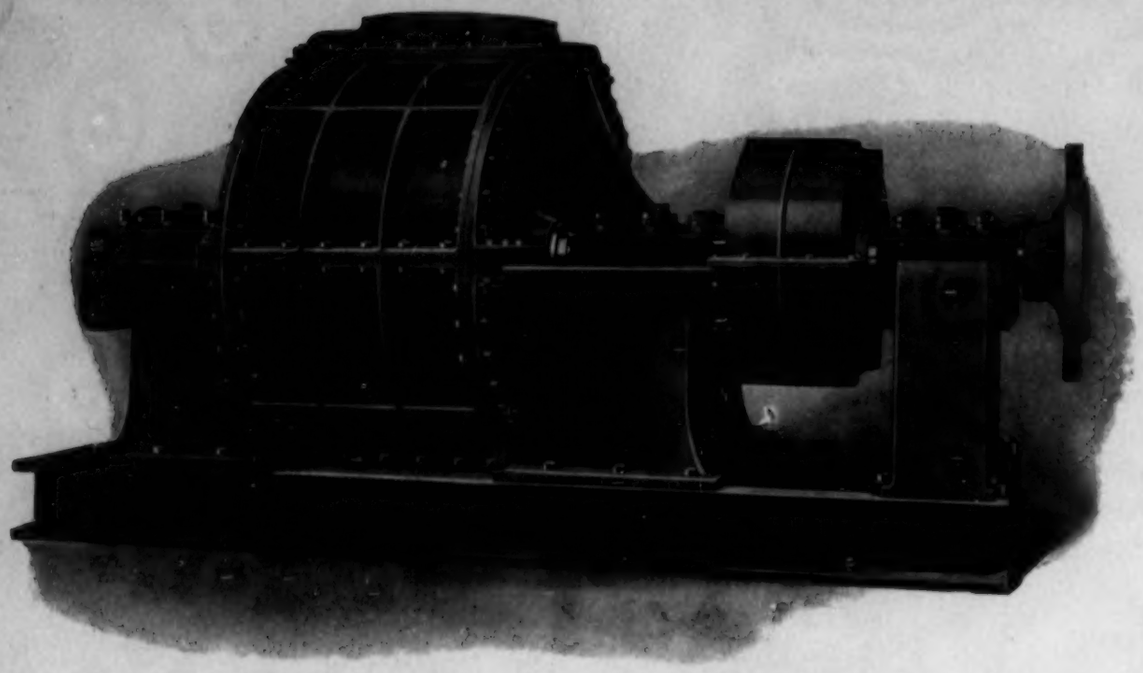

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THE IRON TRADE REVIEW

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Higher Prices on Many Products

Pig Iron Quotations Advanced Rapidly, But the Upward Movement of Finished Material Continues—Tremendous Tonnage of Plates Pending

ADVANCES in pig iron during the past two years have been very slow, compared with the upward movement in quotations on nearly all finished products, but during the last few weeks the marking up of pig iron quotations has proceeded steadily, until now very high quotations are prevailing throughout the country and still further advances are expected. Finished materials also are being advanced, but price considerations are not paramount. The announcement by the Steel Corporation of a quotation of 3.25c on plates, an advance of $3 per ton as compared with last week, has attracted very little attention, although in ordinary times it would be an announcement of considerable importance. Today the principal concern of buyers is to get their orders placed at any price and to hasten deliveries.

Another bunch of large inquiries for various finished steel products has been put out by warring powers. The French government asks for 50,000 tons of structural shapes for first half, which is an extension of previous purchases for trench material of this kind. The French also ask for a new lot of 75,000 tons of 70 and 80-pound rails.

Pig Iron

Following the sale of very large tonnages, including 20,000 tons in the Pittsburgh district, in the last 10 days, some Virginia furnaces withdrew from the market for the first half of next year and advanced their quotation to $19.50 for No. 2X for last half, and a day or two later, retired entirely from the market. Other Virginia makers advanced to $20 and $20.50, furnace. In eastern territory and also in the south, and, in fact, in nearly all parts of the country, conditions are feverish. Some of the highest quotations heard undoubtedly are nominal and are made by sellers who do not wish to take on additional orders, but sales are being made at higher prices than have prevailed for many years. This is illustrated by the sale of basic and No. 2 foundry at $23, valley, while the bessemer average of $23.65 for October was the highest in a decade and $26 is now the minimum.

Coke

Both furnace and foundry grades of coke have been selling at more than $8, Connellsville, for prompt delivery, but the furnace price seems to have receded to $7. Prices for future delivery are more reasonable and one furnace has made a contract for 10,000 tons per month for delivery throughout next year at $3.75. Car and labor shortages are largely responsible for the extraordinary prices of coke.

Plates

The taking of bids by the government on battleships and destroyers indicates that contracts will be awarded to several ship building concerns and as the companies now feel that they can figure more accurately on the merchant ship building which they will be able to do, they are sending in a very large volume of inquiries for plates. One Pacific coast yard has asked for 28,000 tons, another Pacific coast yard for 15,000 tons, a New York company for 7,000 tons, a Cramp yard 7,000 tons and a Montreal merchant 10,000 tons. Inquiry for export also is heavy and one received at Cleveland from Japan is for 60,000 tons of various kinds of plates. Some mills are, however, giving good delivery on universal plates at 3.50c, while delivery on sheared plates extends for from eight to 10 months, at not less than 4c.

Cast Iron Pipe

The announcement that American foundries had been unsuccessful in competition with British plants in the awarding of 65,000 tons of cast iron pipe for Buenos Aires proved incorrect, as the tonnage was taken by the United States Cast Iron Pipe & Foundry Co. This transaction is a fine illustration of satisfactory results of close co-operation of American banking interests and manufacturers.

THE OPEN HEARTH

Getting Their Money's Worth

UNPRECEDENTED rises in iron and steel prices have affected no single class of consumers so sweepingly as the railroads. From the very nature of their business, the rail transportation companies are the largest customers of the iron and steel works and have been so for many years. Despite the abnormally heavy purchases by Europe for war purposes during the past year or more, they still retain this distinction.

The great increase in the cost of supplies and materials for operation and maintenance during the past year, dating from about Oct. 1, has been set forth in detail in a recent statement prepared by the New York, New Haven & Hartford Railroad Co. The average rise in such prices, excepting those for fuel, rails and ties, amounts to 60 per cent. The advance in certain steel products commonly used by the railroads, is striking. In boiler plates, it has been 226 per cent; in firebox steel, 195; in tank plates, 142; in nuts, bolts and rivets, from 67 to 140; in steel bars, 77; in iron bars, 95, etc. Brass and steel castings have gone up 107 per cent, but gray iron castings, only 13 per cent.

It is significant that in this compilation of increased iron and steel prices, rails have been excepted. The railroads have been more than well treated by the manufacturers in this product, of which the tonnage annually purchased by the former is probably the greatest of any single finished steel line. Present prices in open hearth rails are only about 16 per cent higher than they were before the present advancing market movement set in and in bessemer rails, about 22 per cent. Furthermore, the full orders at these levels have been accepted for delivery throughout the year of 1917. That the railroads have made a very profitable purchase for themselves at these prices one has only to consider the intrinsic value of the steel entering into these rails as gaged by the prices on other rolled products.

Now the railroads, perceiving their advantage and to protect themselves on their future needs, are coming out for tonnage for 1918 delivery. The manufacturers have had the matter of price under consideration, but at least some makers have sold at the same price as for 1917. This is surprising generosity on the part of the mills, regardless of any question of policy that might be involved. It would appear that the railroads, benefiting heavily as they are from the prosperity of the steel industry and the country at large, are amply able to pay a fair market price. The matter of rail price, however, now and always, should be subordinated to that of quality. With a place for practically every pound of steel at present the extra cost and attention in manufacture, necessarily required by exacting specifications, is something for which most certainly the mills are entitled to adequate compensation. They are not getting it at current rail prices.

The Tribute to Judge Gary

IN 1909, after the trying times following the panic of 1907, about 50 leaders of the iron trade presented to Judge Gary a beautiful gold vase and a vellum booklet, inscribed with a message of well wishes, signed by the subscribers. The presentation at the dinner of Oct. 15, 1909, and the accompanying speeches were indeed an impressive tribute to a distinguished leader. Seven years later, 1,500 members of the institute united in an expression of confidence and admiration. Perhaps no feature of the presentation last Friday pleased Judge Gary so much as the fact that all the members of the institute heartily participated. The institute has been growing, and so has the popularity of its president. While seven years ago there was much misunderstanding on the part of people who did not know him, the passing years have given him an opportunity to make perfectly clear the principles for which he stands.

At the meeting in St. Louis, Judge Gary, statesman in business, appeared bigger and broader than ever. It was not new for him to have worldwide vision, as long ago, before the Brussels conference in 1911, Judge Gary was working to bring about a better spirit of mutual confidence and co-operation among the steel manufacturers of the great nations. If the policy of which he was the leading sponsor had prevailed in business and governmental affairs, Europe would not now be drenched in blood and all the great nations would be carrying on business and politics without ill will toward each other. Returning from his trip to the Orient, Judge Gary gave a very interesting and statesmanlike account of his trip, showing how it is entirely possible for the United States to continue friendly relations with China and Japan and to promote a better feeling throughout the world. Contrast Judge Gary's St. Louis speech with the harangues of noisy disturbers who have done their utmost to precipitate a war between the United States and Japan!

In discussing conditions as they really are, and in insisting upon the golden rule being applied in the affairs of nations, while at the same time showing that adherence to the highest ethics does not mean self-sacrifice by any nation, Judge Gary has

THE OPEN HEARTH

added to his fame and rendered service of the highest character to his country.

The Negro and the Labor Question

THE negro of the south is becoming an increasingly important factor in the solution of the labor problem of the country. Ralph W. Tyler, auditor of the navy under the Taft administration, a negro of ability, has been making a study of the subject and as a result of his investigations he says that during the past two years 326,876 native blacks of the south have moved north and spread themselves over Ohio, Indiana, Illinois, Michigan, northwestern Pennsylvania, Delaware, New Jersey, New York and the New England states. Mr. Tyler, who was well acquainted with the late Booker T. Washington, expresses the conviction that if that distinguished educator were alive today, he would strenuously discourage this large and unusual migration of negroes from their southern homes, for the reeason that he sincerely believed that the south was the best place for the great masses of the race, and because he believed that any great influx of negroes in the northern states would germinate a problem in the north not dissimilar to the one that has long existed in the south. Mr. Tyler cites numerous facts to show that as the percentage of negroes increases in a community, their treatment at the hands of the whites shows a decided change. He shows how Boston and other cities of the north, once very friendly to the negro, have discriminated against him in recent years.

So much for the social problem. Evidence offered by others shows that the importation of negroes into the north is not improving labor conditions very rapidly, if at all. A railroad representative who for months has been making a business of importing negroes from the south informs *The Iron Trade Review* that some are returning to their native land, while many others are restless and going from one employer to another. Railroads which pay only $2 per day for common labor are not able to retain the services of the negroes, who quickly find that they can get higher wages from other employers. But even the higher wages do not satisfy, largely because the imported negro, living away from his friends and families, as most of them do, is unhappy. It is clear that if the negro is to become a permanent inhabitant of the northern states, he must be encouraged to come with his relatives and a comfortable home must be provided.

As the weather becomes colder, the difficulty of retaining the southern negro in the north will increase and doubtless many will go back to the land of Dixie. Further developments in the movement of the negroes will be awaited with interest, not only in the north, but also in the south, where many employers are vigorously resenting the efforts to deprive them of laborers who are badly needed.

State or Federal Control?

THE Newlands joint committee of congress will begin important hearings in Washington on Nov. 20. They grow out of recommendations made by President Wilson in his message to congress at the last session in connection with the then threatened railroad strike. Among the topics to be taken up is one dealing with regulation and control of interstate carriers. It seems certain that virtually all of the state commissions will be represented before the committee and make earnest efforts to thwart plans for federal incorporation and control of the railroads. Railroad interests evidently are strongly in favor of this scheme. At the same time, President Hale Holden, of the Chicago, Burlington & Quincy railroad, has said that the railroad interests of the country are not trying to destroy the state commissions. Other prominent men in the railroad business have said there is no desire to give the interstate commerce commission full power of regulation. Rather, it seems to be their idea that the federal commission should have complete jurisdiction over railroad operations of other than state wide character. The work that would remain for state commissions would be confined exclusively to affairs concerning intrastate lines.

The eternal conflict that results from regulation and control of the interstate carriers by 48 state bodies and one federal commission is costly and extremely vexing to shippers. But for the affected carriers it is much more than that. Called upon by each commission to observe different standards of operation, to file endless numbers of tariff schedules, to appear at hearings to make a multitude of reports, etc., all semblance of uniformity is destroyed; expenses that are both tremendous and useless are involved and a perpetual turmoil between the shipping and transportation interests ensues. It is no wonder that fear of bankruptcy is entertained by many railroad operators. The wonder is that there have not been more railroads thrown into receivership than has been the case.

The more the transportation problem is studied, the more apparent it becomes that federal control of interstate carriers is necessary. Indeed, it may be the only alternative of government ownership.

Wm. Tod Co.

Is Taken Over by the United Engineering & Foundry Co.

The William Tod Co., Youngstown, O., a manufacturer of heavy engines, pumps and hydraulic machinery for the iron and steel trade, became, on Nov. 1, a subsidiary of the United Engineering & Foundry Co., which has plants in Pittsburgh and Vandergrift in Pennsylvania, and Youngstown and Canton in Ohio.

The Tod plant will, for the present at least, be operated as a separate unit and with its present operating organization. David Tod is succeeded in the presidency of the company by John T. Harrington, a Youngstown attorney. C. H. Booth, chairman of the executive board of the United company, who together with Mr. Harrington engineered the transaction, becomes vice president. Mr. Tod was elected a director of the new organization, as were Messrs. Harrington and Booth, John Stambaugh and H. M. Kelly. H. J. Stambaugh remains as secretary and treasurer.

All of the capital stock of the Tod company was acquired by the United company, consisting of: Authorized, $1,000,000 common and $500,000 7 per cent cumulative preferred; outstanding, $1,000,000 common and $339,800 preferred; shares, $100. The Tod interests exchanged their stock for United stock, thereby acquiring large interests in the latter company, of which I. W. Frank is president.

William Tod founded his company in 1856.

Death of James C. Wallace

James Chase Wallace, former president of the American Ship Building Co., died Oct. 31 at his home, 13526 Detroit avenue, Lakewood, O., after an illness extending over several months.

Mr. Wallace was born May 23, 1865, a son of the late Robert Wallace, who was one of Cleveland's pioneer ship builders. The younger Wallace followed in his father's footsteps and devoted his life to the building and operating of ships. With his father he organized the Cleveland Ship Building Co., and afterward effected the organization of the American Ship Building Co.

Mr. Wallace began his business career in 1881 by starting his three years' service as a machinist. When the Cleveland Ship Building Co. was formed in 1887, he was placed in charge of the drafting room. In 1890 he was named assistant superintendent of the company, and in 1893 he was chosen vice president and general manager. When the American Ship Building Co. was formed in 1899, it taking over the plant of the Cleveland Ship Building Co., Mr. Wallace was named vice president and general manager of the new concern. This position he held until early in October, 1904, when he was chosen president of the American Ship Building Co. in succession to A. B. Wolvin. He retained the presidency until Sept. 23, 1914, when Edward Smith, since deceased, was elected to succeed him.

New Record

Made by Exports—Pig Iron Movement Shows Increase.

Exports of iron and steel products reported on a tonnage basis made a new record in September according to the statistics reported by the bureau of foreign and domestic commerce, the tonnage for September being 643,762 compared with 597,739 in August, which up to that time was the largest tonnage since the opening of the European war.

Pig iron exports for September show an increase over August, when 60,264 tons were received in this country, as compared with 28,718 tons in July. The exports of pig iron for September were 64,122 tons.

The tonnage of imports shows a decrease, being only 25,559, as compared with 32,257 in August.

The total value of exports of iron and manufactures for September again shows an increase, the total being $90,895,592, compared with $86,296,703 in August, 1916 and $38,522,175 in September, 1915. For the nine months ending September, 1916, the total value was $619,853,667, compared with $251,220,088 for the nine months of 1915. The value of imports was slightly less than for the previous month, but greater than for September, 1915, the figures being $2,859,787, $2,888,390 and $1,367,166, respectively. Imports for the first nine months of 1916 have amounted to $20,537,811, compared with $14,818,206 for the same period in 1915.

The imports of ferro-manganese amounted to 9,787 tons in September, 1916, and 8,525 tons in August, 1916.

The complete statistics for August, noiw available, show that the value of machinery exports reached a tota lof $24,657,597, as compared with $11,437,076 in August, 1915, and $18,971,052 in July, 1916. Exports of zinc, except ore and dross, were valued at $6,261,500 in August, 1916, $3,010,922 in August, 1915 and $4,877,651 in July, 1916.

Wharton Plants

Taken Over by J. L. Replogle and Associates—Will be Enlarged

New York, Nov. 1. (By wire.)—J. L. Replogle and associates have taken over from the Joseph Wharton heirs the properties of the Wharton Steel Co., Wharton, N. J., which have been inactive for a number of years, and it is proposed to use them as a basis for new steel works and finishing mills, the details of which are not yet worked out. The properties consist of three blast furnaces, 5,000 acres of ore lands near Wharton, ore buildings near Sprague ville, N. Y., 7,500 acres of coking lands and coke plant in Indiana county, Pa., also the Wharton & Northern R. R., 22 miles long.

Some months ago, L. L. C. Kackelmacher and associates obtained an option on the Wharton properties in an effort to combine certain eastern blast furnaces and Mr. Replogle succeeds to this interest. Associated with him is Ernest Hillman, of J. H. Hillman & Co., Pittsburgh. The Wharton company has been capitalized at $10,000,000.

Steel Earnings

Make a New Record in Spite of Decreased Production

New York, Oct. 31.—Net earnings of the United States Steel Corporation for the third quarter of the calendar year, issued today, established a new high record at $85,817,067, exceeding the previous best statement, that of the preceding quarter, by $4,691,019.

Net income of $75,202,408 surpassed the previous record by $3,822,186 and the quarter's $51,859,450 surplus after dividends represents an increase of $3,894,915.

The extra dividend of 1 per cent on the common stock, inaugurated at the last quarter was again declared, with the usual dividends of 1¾ and 1¼ per cent on the preferred and common.

While below the more extravagant estimates, the quarter's earnings showed steady monthly gain. July earnings, after payment of the usual interest charges were $25,650,006, those of August $29,746,903 and of September $30,420,158.

For the first nine months' earnings available for common equaled almost 32 per cent, compared with 4.13 per cent in the corresponding period of 1915. At the end of the third quarter of 1914, after payment of only ½ of 1 per cent on the common stock, the corporation reported a surplus of less than $90,000, this being followed at the end of the year by suspension of the common dividend and a deficit of $5,606,283 after payment of the preferred dividend.

Tool Buying Lags Then Skyrockets

Orders Placed Early in Month Were Very Mediocre But for the Last Two Weeks Market Has Been Hitting the High Spots—Gun Builders and Ship Yards Largely Responsible

BUYING in the machine tool market during October was of increasing proportions and by the end of the month the business being transacted was of enormous volume. Not only were a large number of orders placed by concerns that are expecting to participate in the work connected with the government's huge naval construction program, but a tremendous amount of miscellaneous business also was booked. Car building concerns during October closed on large quantities of equipment and the railroads and shipyards purchased heavily. In addition, foreign demand, while not especially active, improved steadily during the month. France, Italy and Russia were the biggest buyers of machine tools for shipment abroad, although a good volume of inquiry was evident from time to time from South American countries.

One of the most notable transactions of the month was an order placed with a Cleveland builder for 1,800 lathes, this business being for delivery over the next three years. Two of the leading ordnance builders, the Bethlehem Steel Co. and the Midvale Steel & Ordnance Co., placed orders for machine tools involving approximately $1,000,000 and $550,000 respectively.. The latter company also purchased a large number of cranes for its plant at Sparrows Point, Md. Among the ship building concerns to place considerable business in October are the following: The Sun Ship Building Co., Chester, Pa.; Samuel L. Moore & Sons Corporation, Elizabeth, N. J. and Texas Steamship Co., Bath, Me. The Indiana Steel Co. made purchases for its new plate mills at Gary, Ind., amounting to more than $1,000,000. Included among the other large buyers of machine tool equipment were: The American Bridge Co., The Trumbull Steel Co., The Barney & Smith Car Co., Matthews Gravity Carrier Co., Illinois Steel Co., Standard Steel Car Co. and Pressed Steel Car Co. A considerable proportion of the railroad business of the month was placed by the Pennsylvania, Baltimore & Ohio, Santa Fe, Union Pacific and Southern Pacific systems.

Prices Fluctuate During Month.

Prices during the month were advanced in several instances. In the east a rise of 10 to 12½ per cent was put into effect on planers, shapers and radial drills, while an increase of about 25 per cent was made by an eastern builder of boring and turning mills. Advances on several machines were also made by manufacturers in the middle west. On the other hand, a reduction in the prices of some machines was reported to be not far off and it is understood that a large manufacturer of hydraulic machinery is considering action with this end in view.

The situation with regard to the delivery of tools was changed but little. Deferred shipment on heavy equipment generally were offered and in several cases the spread was no less than eight or nine months. Small lathes, radial drills and certain other machines of the lighter type were obtained comparatively easily. Reflecting weakness in the market for shell-making equipment, the Baldwin Locomotive Works offered for sale approximately 350 shell-making lathes, involving practically all sizes up to 32 inches. The offer of these tools for sale apparently did not affect the market.

Delivery Clause Hampers Crane Buying.

Activity in the crane market was retarded to a great extent owing to the inability of builders to give definite assurances regarding shipment. It is understood that cranes were sold in some few instances for delivery as late as 1918. However, some good-sized orders were placed, and perhaps the largest of these was the order the Bethlehem Steel Co. divided between the Morgan Engineering Co., Alliance, O., and the Alliance Machine Co., Alliance, O., calling for about 30 cranes for the Bethlehem company's plant at Sparrows Point, Md. An additional number of cranes was under negotiation by the Bethlehem company at the end of the month for installation at South Bethlehem, Pa. Another large inquiry for cranes before the market during the month was that of the General Electric Co. The machines were for installation at Schenectady, N. Y., and Worcester, Mass.

Ship Yards Large Prospective Buyers

The ship builders in particular were prominent as prospective buyers at the end of October, and one company had a list out involving approximately $1,000,000, while some of the other lists are said to involve even greater amounts. Among other companies which have good sized inquiries pending for machine tools are: Nathan Mfg. Co., Driggs-Seabury Ordnance Co., General Electric Co., Corrigan, McKinney & Co., Climax Motor Devices, and the Willard Storage Battery Co.

The Bethlehem Steel Co. has awarded contracts for extensions and improvements to its Sparrows Point plant, Sparrows Point, Md. The Dravo Contracting Co., Pittsburgh, will put in foundations for buildings, blast furnace and rolling mill equipment for the Bethlehem company.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products November 1, average for October, 1916, average for August, 1916, and average for November, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Nov. 1, 1916.	Aver. for Oct., 1916.	Average for Aug., 1916.	Aver. for Nov., 1915.
Bessemer pig iron, Pittsburgh..	$26.95	$24.325	$21.95	$17.45
Basic pig iron, Pittsburgh.....	23.95	20.825	18.95	16.70
No. 2 Fdy. pig iron, Pittsburgh	23.95	21.075	19.45	16.45
Northern No. 2, Fdy., Chgo....	24.00	19.15	19.00	17.12
Lake Superior Charcoal, Chgo..	23.75	20.35	19.75	17.50
Malleable, Chgo.	24.00	19.50	19.50	17.40
Southern No. 2, Birmingham...	17.00	15.13	13.75	13.13
Southern Ohio No. 2, Ironton..	21.00	19.38	18.50	16.13
Basic, eastern Pa.....	22.00	20.75	19.25	17.75
No. 2X Virginia furnace.....	20.00	18.50	18.50	15.50
No. 2X foundry, Philadelphia...	22.75	20.75	19.75	17.50
Ferro mang., Balti.....	164.00	162.00	175.00	100.00
Bessemer billets, Pbgh.....	50.00	45.75	43.60	27.75
Bess. sheet bars, Pbgh.....	50.00	45.75	43.60	28.25
Op.-h'th sh. bars, Pbgh.....	50.00	45.75	43.60	28.50
Open-hearth billets, Pbgh.....	50.00	45.75	43.60	28.00
Steel bars, Chgo.....	3.10	2.79	2.77	1.79
Steel bars, Pittsburgh, contr....	2.70	2.60	2.50	1.625
Iron bars, Philadelphia.....	2.659	2.659	2.559	1.759
Iron bars, Cleveland, local del'y.	2.55	2.55	2.40	1.50

	Prices Nov. 1, 1916.	Aver. for Oct., 1916.	Average for Aug., 1916.	Aver. for Nov., 1915.
Iron bars, Chgo. mill.....	$2.45	$2.35	$2.35	$1.48
Beams, Chgo.	3.30	2.80	2.77	1.79
Beams, Pittsburgh, contr.....	2.80	2.70	2.50	1.625
Beams, Philadelphia	2.959	2.859	2.709	1.809
Tank plates, Pbgh., contract....	3.25	3.00	2.90	1.625
Tank plates, Chicago.....	3.50	3.19	3.17	1.79
Tank plates, Philadelphia.....	3.909	3.309	3.909	1.809
Sheets, blk., No. 28, Pbgh.....	3.50	3.225	2.75	2.22
Sheets, blue an., No. 10, Pbgh.	3.25	3.125	3.00	1.85
Sheets, galv., No. 28, Pbgh....	5.00	4.45	4.25	3.90
Wire nails, Pittsburgh.....	2.70	2.625	2.59	1.87
Connellsville fur. coke, contr...	3.75	3.375	2.40	2.35
Connellsville fdy. coke, contr...	5.00	4.875	3.15	2.96
Heavy melting steel, Pbgh.....	19.00	17.87	16.00	15.31
Heavy melting steel, east'n Pa..	16.50	15.50	15.00	14.50
Heavy melting steel, Chgo.....	17.50	16.50	14.90	13.15
No. 1 wrought eastern Pa.....	22.00	22.00	20.00	17.00
No. 1 wrought, Chgo.....	18.75	17.50	15.40	12.75
Rerolling rails, Chgo.....	21.50	18.75	15.70	14.30
Car wheels, Chgo.....	14.50	12.25	11.90	12.75

(For Additional Prices See Page 924.)

Pig Iron Market Very Excited

Prices Advancing Rapidly and Some Furnaces, Including Virginia Stacks, Withdraw From Market—Danger of Runaway Conditions Realized in Conservative Circles

Philadelphia, Oct. 31.—Following another week of feverish and excited price movements, pig iron has become scarce in this territory, either through heavy sales or through tonnages withdrawn from the market by the furnaces and buyers are able to induce the acceptance of new orders only by very attractive offers. At least another dollar has been added to the actual sales figure by the week. Virginia makers have been among the leaders in the volume of business closed in this and other eastern districts, and some large tonnages were taken by these furnaces. As a result, the Virginia Iron, Coal & Coke Co., which previously had withdrawn for the first half and had advanced to $19.50 for No. 2X for last half, today retired entirely from the market. Other Virginia makers have advanced to $20 and $20.50, furnace, or $22.75 to $23.25, Philadelphia. Half of a 15,000-ton basic order for November-February of the American Iron & Steel Mfg. Co. went to a Virginia maker at $21.50, delivered, or $19, furnace. The destination of the remainder of this business is not certain. The price sets a new high for the basic market in eastern Pennsylvania. A Cumberland steelmaker also took 1,000 tons of early Virginia basic. A 10,000-ton lot of basic is under negotiation in addition to a tonnage for a Newark, N. J., steel works. A lot of low phosphorus basic for second quarter was closed at $25, eastern Pennsylvania furnace, and there are reports of other sales at the same figure.

Low phosphorus has brought out some good sized sales. A Pennsylvania steel company bought about 10,000 tons from a Lebanon maker and some tonnage from other eastern producers. A steel foundry took 1,000 tons. Standard low phosphorus remains at $40 to $42, Philadelphia, and 0.04 metal has been quoted at $38, eastern furnace. Lebanon grades are from $35 to $37, furnace.

A number of sales of eastern Pennsylvania No. 2X now have been made at $23, furnace, or $23.79, Philadelphia. No. 2 plain has been sold at the same figure, and transactions in this grade at $21.75, furnace, for first half also are noted. Some makers now hold $23, furnace, for No. 2X as their minimum. Others ask $22 for this year and $23 for first half. The Philadelphia market is quoted at from $22.50 to $23 for No. 2X. It develops that the purchases of foundry and charcoal by the Pennsylvania railroad for first half were heavier than previously reported and totaled 8,000 to 10,000 tons, much of which went to Virginia. This buyer now is talking last half iron. A Burnham, Pa., steelmaker asks 3,000 tons of first half foundry. A 15,000-ton export inquiry for Alabama iron was current this week. A Delaware river pipemaker bought 4,000 to 5,000 tons, including considerable No. 2 plain Virginia. Pipe forge is quoted $20 and upward along the river. Misfit basic has brought $20.50, eastern Pennsylvania furnace.

Chicago Market Higher

Chicago, Oct. 31.—Apparently nothing too strong can be said about the Chicago pig iron market. Prices have been advancing steadily and have reached a point where the quotation of one hour may not be that of the next. Prices are difficult to determine with accuracy, as the situation moves too swiftly.

All northern grades, foundry, malleable and basic, are quoted today at $24, Chicago furnace, and sales actually have been made at that level. This does not mean that the next transaction might not be at $25, furnace. The quantity of first half iron remaining unsold is so small that it will be exhausted in a short time, and makers find they are able to obtain much higher prices for the small re-

(*For complete prices see page* 924.)

mainder. Buyers have appreciated the situation and little argument is made over price, the principal consideration being ability to place contract. No inquiry for basic is being entertained at present, but a round tonnage was recently sold on a basis slightly under the present quotation.

Northern iron of southern analysis is being sold at the equivalent of $18, Birmingham. The southern market is not being taken into consideration in selling this iron, and active competition from the south is not being encountered. It is difficult to determine just what prices are being made on southern iron. Some makers are out of the market because they are well sold up for first half, and others on account of uncertain coke supply. This makes it difficult to obtain quotations. It seems probable that some iron could be bought at $17, Birmingham, but warrant iron is said to have been sold recently on a basis of $19, Birmingham.

Higher quotations have come out on Lake Superior charcoal iron, $23.75 to $24.75, delivered Chicago, having been made on recent sales. All contracts must be submitted to the furnace before being confirmed. The prices are not guaranteed from day to day.

Bessemer iron for domestic use is difficult to obtain, and the opinion prevails in some quarters that $30, Chicago, might be the minimum, should a consumer seek a round tonnage.

Prices Advancing

Cleveland, Oct. 31.—One Cleveland firm has sold No. 2 foundry at $24, valley, and basic at $23. Another Cleveland firm is quoting $23 at Cleveland furnace and has made sales at that figure. The market is very strong, but sales in the immediate Cleveland district are not numerous. Inquiries for bessemer for export are being constantly received, but are not very attractive under present conditions.

A very interesting feature of the Cleveland pig iron market is the very active buying of southern grades, several thousand tons having been booked during the past few days at $17.50, Birmingham, for No. 2, or $21.50, Cleveland, and it is doubtful whether any more southern iron can be had at this figure. There is a pronounced shortage of low phosphorus. The prevailing quotation is $40 to $41, Pittsburgh.

Approaching Iron Famine

Buffalo, Oct. 31.—For the first time in years the stocks of the pig iron producing interests are practically nil. Prices have reached a point where only nominal schedules may be quoted. At this writing, the range for foundry grades is $24 to $26 at the furnace. One interest here is holding to $25 as its positive minimum. High silicon irons are being held at $25 to $27. The last quotation here on basic was $26 and charcoal iron has gone to $25 to $27.

The advances have taken place over night, in many cases, and there are instances reported where quotations have been withdrawn within the brief interval required to secure telegraphic confirmation of an order under negotiations. Furnace interests are not working in unison to advance prices in keeping with a general understanding of the supply and demand situation. There is one point, however, on which all are agreed, and that is, if possible, to hold in check and perhaps prevent a runaway market. It is recognized in the face of this effort, however, that iron, to meet the demands of many interests that are but partially covered for their needs into and through next year, is becoming almost unobtainable.

The serious shortage of coke, shortage of labor, shortage of cars and the length of time taken by buyers to recognize that they are not only short of iron, but will need increased tonnages to meet their future demands, all make up the present strained situation, with little or no sign of relief in sight.

The sales during the past week made by the furnaces of the Buffalo district for delivery over the rest of this year and through first and second half of 1917 amounted to a total of 50,000 to 60,000 tons. The price advances noted took place after these sales were booked.

The Lackawanna Steel Co. has entered into a renewal of the contract with Rogers, Brown & Co. for the delivery of hot metal from the Susquehanna furnaces at Buffalo to the Lackawanna Steel Co., whose plants are on adjoining properties. Under this contract, the Lackawanna Steel Co. is now taking and will continue to take over the remainder of the year and through all of 1917 the output of two of the stacks of the Susquehanna furnaces.

High Prices Attract Virginia Furnaces

Pittsburgh, Oct. 31.—Virginia blast furnaces, attracted by the high prices of pig iron in this and adjacent districts, have been very active factors in the market the last fortnight. It is conservatively estimated that fully 20,000 tons of Virginia iron have been sold to consumers in Pittsburgh and its vicinity for delivery the first and second half of next year. Virtually all Virginia blast furnace interests, after selling actively, have withdrawn from the market. Some Virginia tonnage has commanded as high as $23.04, Pittsburgh, for No. 2 plain foundry iron, or $20, furnace.

Basic pig iron now is quoted at $22 to $23 a ton. One lot of 10,000 tons has been sold at $22 and smaller lots at $23. Several consumers have offered to pay $22, valley, for basic iron for shipment the first six months of 1917. The American Steel Foundries is negotiating for about 20,000 tons of this grade for first half shipment to plants at Sharon, Pa., and Alliance, O., and the Youngstown Iron & Steel Co. is reported to be inquiring for from 15,000 to 20,000 tons for delivery the first five months of next year. Twenty-seven dollars has been offered for bessemer iron, but no sales have been reported at above $26, valley. Rather heavy tonnages of foundry and malleable grades have been sold at $23, valley, and as high as $24, valley, has been paid for small lots. Needless to say, these prices are the highest reported in many years. Some of the larger steel works interests tentatively are figuring in the market for steel-making grades.

Market Greatly Agitated

New York, Oct. 31.—Heavy sales on a sharply-rising scale of prices are keeping the pig iron market in a very agitated state in which signs of some panicky feeling among the buyers have been present. The furnaces are assuming an attitude of strong independence in making new sales and a number of them are declining to quote at all, with the result that consumers are finding increasing difficulty in getting their requirements under cover and have been taking iron up to Jan. 1, 1918. Offerings are steadily contracting. Eastern Pennsylvania No. 2 has been sold in this territory both for first and second halves at $23, furnace, or $23.74, tidewater. For first half, $23.90, Brooklyn, has been paid. Prompt Virginia has been sold at $20 and $20.50, furnace.

One Buffalo maker has quoted $25, furnace, for No. 2X and has little to sell for any delivery next year. A Newark steelmaker bought 10,000 tons of northern basic, low in phosphorus, for first and second quarters, at about $25, delivered, and will place 5,000 to 10,000 tons more later. The General Electric Co. bought 15,000 tons of foundry for its various plants for delivery running through the last half of 1917 and a large part of this went to Virginia makers. This buyer still inquires for 1,000 tons of malleable for Erie. A Newark stovemaker is buying against an inquiry for 3,000 to 3,500 tons, some for last half. An-

(*For complete prices see page 924.*)

other Newark shop took 2,500 tons; a Brooklyn buyer, 500 to 1,000 tons and there are inquiries for 1,000 tons each from Hudson river and Connecticut buyers. A Depew, N. Y., consumer wants 5,000 tons of basic. Export business has dropped off this week, as buyers have not been willing to pay the higher prices, but there is a heavy inquiry. Sales of Alabama for export have been made at $16.50, Birmingham, and $17 is said to be obtainable.

Bessemer is very scarce and has sold as high as $29, eastern furnace, on a fair-sized lot. Sweden is closing 4,000 to 4,500 tons, mostly foundry. There also is a new Swedish inquiry for 20,000 tons, which is not taken seriously. Norway wants 2,000 foundry and Canada 1,500 bessemer. The Dutch East Indies has been a buyer. Southern makers say they could close 150,000 tons for export if the ships were available.

Strong at St. Louis

St. Louis, Oct. 31.—While all indications in this district point to strong conditions in the pig iron industry, about the only inquiries in sight are several ones for small tonnages and one for 2,000 tons of northern malleable iron. One of the best sales made last week was 1,000 tons of northern malleable to a local industry.

Southern iron is held at $17 to $17.50, Birmingham, for delivery over the first half of next year, and some firms are out of the market for delivery over the rest of 1916.

Heavy Sales, Higher Prices

Birmingham, Ala., Oct. 31.—During the past week the market experienced a dollar a ton advance over the previous week, and some heavy sales were made at the prevailing prices. Pig iron is firmly quoted at $16.50 to $17 per ton f. o. b. cars at the furnace in the Birmingham district for No. 2 foundry; and as much as $18 to $18.50 per ton has been offered for Birmingham basic iron. Some heavy sales of premium iron were also made during the week. It has been the policy of the iron interests to withhold the sale of 25 per cent of the make for first half in order to be in position to care for old customers that might come in the market for any uncovered tonnage, or for sale at any heavy advance in price. This tonnage was very materially reduced during the week on the dollar a ton advance. Already the iron interests are being besieged to take on additional business, but the majority of the companies are advising clients that they prefer not to quote on further orders. In some instances, buyers have come back with counter propositions on a higher basis, and they have been so attractive that sales have been made. The interests in general prefer not to encourage a run-away market, and for that reason are strictly maintaining that they are out of the market when the heavy inquiries for foreign movement are submitted. Considerable of this tonnage is now pending, and should buyers continue their insistency the market is likely to advance to $17.50 to $18 per ton by the end of this week.

Market Running Wild

Cincinnati, Oct. 30.—The southern pig iron market is running wild. Prices are changing from day to day, and all quotations made by dealers are subject to confirmation by furnaces. Demand is good and is far in excess of the supply of iron available. Several furnaces in both the south and southern Ohio are sold up for the first half of next year, and others, which still have some iron to be disposed of, are refusing to put it upon the market, with the expectation that higher prices will be realized in the near future. The price of southern No. 2 foundry iron today is given at $17.50, Birmingham basis, for the first half of next year, with no quotation available for the last half of 1917. One sale is reported made today in Chicago territory at $19, Birmingham basis, for the first half. It is almost a certainty that $18, Birmingham basis, or even higher, will be the prevailing price before the end of the present week. Southern Ohio No. 2 foundry iron is more steady than southern grades, principally because the supply of the former has been cut off, as furnaces in the Ironton district have refused to put any iron upon the market in the past three weeks. The nominal quotation for southern Ohio No. 2 is $21, Ironton basis, for the first half of next year, and $22 for the last half of 1917. The latest furnace to withdraw from the market is the Virginia Iron, Coal & Coke Co., which has notified all agents that it will not sell either No. 2X or Watts iron until further notice.

Cold Rolled Strip Steel

The strength of the market for cold rolled strip steel was strikingly illustrated this week when a buyer tried to place a large tonnage with a certain producer. The buyer stated that he had tried without success to place the tonnage with other mills but could not obtain delivery before July 31, 1917. The order was for export and delivery at New York was specified before June 15. The buyer laid the contract before the mill and urged that the mill's own figure be filled in, just so the desired delivery was guaranteed.

(*For complete prices see page* 924.)

Warehouse Prices

Are Advanced Sharply at Chicago and Cleveland

Chicago, Oct. 31.—Effective Nov. 1, Chicago warehouses will make an increase of $2 per ton on bars and shapes and $5 per ton on plates. This will make the quotation on the former 3.35c and on the latter 4c. No. 10 blue annealed sheets will be advanced to 3.65c, and black sheets have already been placed at 3.90c.

These are marked advances over the figures prevailing and mark the strong situation of store stocks on which heavy demand is being made to fill needs that mills cannot supply. It is increasingly difficult to keep assortments full in warehouses under the prevailing conditions of demand.

Bar iron is being carried now on the same base as steel bars and will advance Nov. 1 to 3.35c. No. 28 gage galvanized sheets were advanced Oct. 30 to 5.40c, following heavy advances by mills.

Advances at Cleveland

Cleveland, Nov. 1.—The Cleveland warehouses did a large business last month and one company reports a highly satisfactory volume of business. Prices paid for material from store are, however, advancing and warehouse profits are not as large as they were. Prices have been advanced as follows: Steel bars, $2; shapes, $4; plates, $6; hoops, $5; No. 28 black sheets, $7; No. 28 galvanized sheets, $4. Prices now are as follows: Steel bars, under 2 inches, 3.50c; squares and rounds, 2 inches and over, 4c; shapes, 3.60c; plates, 4.10c; No. 28 black sheets, 3.75c; No. 28 galvanized sheets, 5c; hoops, 4.25c. No change has been made in quotations on iron bars, which remain at 3.35c, or on No. 10 blue annealed sheets, which are still quoted 3.70c.

Nuts, Bolts and Rivets

Pittsburgh, Oct. 31.—Recent advances in the price of bars likely will be followed by the adoption of higher quotations for nuts, bolts and rivets.

Specifications for domestic delivery continue very heavy and numerous inquiries are pending for export. Structural rivets continue to be quoted at 4c.

Swan F. Anderson has disposed of his interest in the Rockford Tool Co., Rockford, Ill., and with his brothers H. E. and A. L. Anderson has formed the Anderson Mfg. Co. This concern has acquired a modern plant for the manufacture of dies, tools, fixtures and special machinery.

Sheet Prices

Are Being Steadily Advanced—Heavy Inquiry For Export.

Youngstown, O., Oct. 31.—Sheet prices are swinging steadily upward. Galvanized sheets, quotable a week ago at 4.50c to 5c, are now held firmly at 5c to 5.25c, an increase of 05 to $10 a ton. Black sheets were quoted a week ago at 3.40c and are now being held at 3.40c to 3.50c with some mills asking 3.75c. Blue annealed sheets were selling at 3.25c a week ago and now are quotable at 3.25c to 3.40c.

The country's biggest sheet producer is still quoting the minimum price on each grade. This interest, according to the belief here, is sold out for the remainder of this year and is practically out of the market for the first quarter of 1917. Some of the independent mills in this district have a restricted tonnage to offer for delivery during the next two months and additional tonnage for first quarter delivery. For these deliveries, higher prices are being obtained.

One big producer in the valleys has raised its minimum price on black sheets from 3.40c to 3.50c and has taken business at the higher figure. Another mill has taken orders at 3.75c and yesterday quoted 4c on black sheets. The latter quotation is far above the market and was doubtless quoted because this mill is unwilling to take on additional tonnage at this time.

Galvanized sheets were sold yesterday by a mill in this district at 5.25c and one producer is holding to that figure as a minimum. The blue annealed sheet market has gained strength in the past few days. One western buyer has offered to take 2,000 tons at 3.35c, but the mill receiving the offer is quoting 3.40c and had not closed today.

The flood of inquiries that developed several weeks ago continues in almost unabated volume. Both domestic and foreign buyers are anxious to cover and are exerting pressure to obtain sheets. As most mills are well sold up for five months ahead, the available tonnage for sale is proving insufficient.

Foreign Buyers Want Sheets

Philadelphia, Oct. 30. — Some heavy export inquiries for blue annealed sheets continue to appear, including a new one of 5,000 tons for Italy. Another Italian inquiry for a considerable amount came up today. The British government has been a buyer of this class of material from eastern mills, the latter, having taken considerable foreign business, now will accept no further orders from that direction. There is good domestic buying, especially for first quarter and in a few cases of regular customers, second quarter contracts have been accepted. Prices now rule from 3.25c to 3.50c, Pittsburgh, or 3.409c to 3.659c, Philadelphia, for No. 10 gage.

Galvanized Held at 5c

Pittsburgh, Oct. 31.—Prices of steel sheet products likely will be advanced several dollars a ton at an early date. Scarcely any of the larger mills have any bessemer black material to offer for delivery this year and galvanized stock is extremely scarce, most mills having disposed of their output the next four or five months. The American Sheet & Tin Plate Co. last week advanced its price of galvanized material from 4.50c to 5c, base, or $10 a ton. Blue annealed sheets continue to be quoted at 3.25c, base, but as high as 3.50c is being paid for some of the heavier gages.

Galvanized Sheets Higher

Chicago, Oct. 31. — Number 28 gage black sheets continue to be quoted at approximately 3.69c, Chicago mill, while No. 10 gage blue annealed may be obtained at 3.44c to 3.69c, Chicago mill, much depending on the width desired.

The leading interest in the sheet business has adopted a basis of 5.19c, Chicago, on No. 28 gage galvanized, and has increased the differential on No. 29 and 30 gages, the former being changed form 15 to 20, and the latter from 30 to 40. Differentials on gages under 28 are not disturbed.

Strong at Cleveland

Cleveland, Oct. 31. — The recent strength of the sheet market is being maintained in Cleveland and the domestic demand is being augmented by active inquiry from a number of foreign countries, including Japan. A Cleveland firm which had been quoting 3.50c on No. 10 black has advanced its minimum to 3.60c.

Lap Welded Pipe

Is Advanced in Price—Butt Welded is Not Changed

Pittsburgh, Nov. 1. (Special wire.)—The National Tube Co. sent out effective today new lap welded pipe, oil country goods and boiler tube cards, carrying quotation advances. The standard weight lap welded pipe was advanced one point, steel boiler tubes were advanced two points and the oil country goods also showed advances. Butt welded pipe prices were not affected. However, since several important steel pipe makers in this district have not been adhering to any formal price schedule, it is regarded in the trade that the National's new quotations are conservative; in fact, several independents have been making sales at prices even higher than the new card. Demand for lap welded tubes and pipe products has grown heavy and the advance was not unexpected.

(*For complete prices see page* 924.)

Cast Iron Pipe

Sales of 65,000 Tons Made For Export to the Argentine Republic.

New York, Oct. 31.—While first advices indicated that British shops had won in competition, later cables received have stated that the United States Cast Iron Pipe & Foundry Co. has received the award of 65,000 tons of various sizes of pipe for extensive sewer and water works at Buenos Aires, at a reported price of $60, delivered. The city of Buenos Aires has been buying about 100,000 tons of pipe, annually, for this work for several years and this business in the past always has gone to British and German foundries. The landing of the contract by the American maker was due to the co-operation by leading New York banks in giving financial backing to the city of Buenos Aires and providing for the purchase of supplies in this country. This co-operation between the banks and the manufacturer has been effective in other recent cases in South America and there are now in prospect additional large orders for pipe. The Buenos Aires pipe will be manufactured in accordance with the European metric standards and will be delivered over the next year.

New buying of pipe has broadened out actively especially by the private users, for spring delivery. Practically all the larger gas companies now are in the market and producers say conditions have not appeared so promising in several years. New York City is taking bids today on 450 tons of 6 to 12's. The expected price advance of $1 per ton went into effect in the week, placing 6-inch class B at $32.50, New York, and 4-inch at $35.50, with the usual $1 differential for Class A pipe. Further advances are expected.

Curtailment Expected

Birmingham, Ala., Oct. 31.—It is the concensus of opinion among the manufacturers of cast iron pipe that the present upward trend of the pig iron market will have a tendency to curtail the buying of pipe, and before many months, will mean the curtailment of output of pipe plants. This is particularly true at this season of the year, which is always comparatively dull. With the advance in pig iron there is strong talk of an advance in pipe prices, though figures have not yet been revised.

New Open Hearths

The Youngstown Sheet & Tube Co. has completed plans for an extension to its open hearth steel works. The McClintic-Marshall Co., Pittsburgh, will furnish the steel, involving about 5,000 tons.

Great Rush for Plates

Inquiries for Many Thousands of Tons for Merchant Ships—Inquiry for Large Tonnage for Japan Received at Cleveland

Philadelphia, Oct. 30.—Under a continuation of a demand for ship plates which is fairly swamping the mills, prices for such material have begun to move to a new high level. Some of the eastern Pennsylvania mills now are naming 4.25c to 4.50c, Pittsburgh, on plates, Lloyd's specifications, and 4c appears to be the absolute minimum among all producers. Marine boiler steel now is quoted at 10c, Pittsburgh, and this price named on 1,000 tons for nine months delivery apparently satisfied the buyer. Other qualities of plates are stronger in sympathy with ship steel and by reason of larger tonnages coming from the car builders, structural shops, etc. The irregularities in tank and universal plates, are being reduced and from 3.50c to 4c, Pittsburgh, now is quotable.

Following last week's opening of bids by the government on battleships, and destroyers which have indicated the probable division of the awards, there has been a rush of inquiries for steel for merchant ships from those builders who can now determine what new work they safely can assume. A Pacific coast interest asked 28,000 tons; a Seattle yard, 15,000 tons; a Delaware River builder, 7,000 tons, and a New York company, 7000 tons. There were numerous other inquiries. One mill booked 13,000 tons of new ship steel orders for shipment at its convenience, all but 1,000 tons of which was plates. A Montreal merchant asked 10,400 tons for shipment to the British Isles. J. P. Morgan & Co. have closed with eastern makers for the 2,000 to 3,000 tons of ship plates recently put out for the Brititsh government. The Southern Railway wants 1,000 tons of universals for car work and the American Car & Foundry Co. is in the market for a tonnage.

Plates for Japan

Cleveland, Oct. 31.—The Carnegie Steel Co. is now quoting 3.25c, Pittsburgh, on plates and a Cleveland company which has been quoting 3.75c as a minimum has advanced to 4c and is not anxious to take orders even at the higher price. This Cleveland company has received an inquiry for about 60,000 tons of plates for shipment to Japan and a number of inquiries from other foreign countries, but will not take on a large tonnage for export. The Japanese inquiry is for numerous sizes and evidently is intended to be a stock for warehouse purposes. Eastern mills can deliver universal plates at an early date, but deliveries on sheared plates extend from eight to ten months.

Plate Minimum Now 3.25c

Pittsburgh, Oct. 31.—The Carnegie Steel Co., on Oct. 30, directed its sales agents to quote steel plates at 3.25c, or $3 a ton above the price put out last Wednesday at New York. Just previous to Oct. 25, steel plates for delivery at the convenience of the mill were offered at 3c, or $5 a ton below the prevailing quotation. One mill is asking as high as 3.50c for shipment at its convenience, and another is quoting 4c for delivery within 60 to 90 days. Frequent predictions are heard that material will command 5c before the end of the second quarter of next year.

Car builders and ship builders are specifying briskly against contracts placed some time ago. Some ship building interests have purchased material for delivery in the early part of 1918. With few exceptions, plate mills have enough tonnage on their books to enable them to maintain present rates of operation well into the third quarter of 1917.

Plate Demand Continues

Chicago, Oct. 31. — Steady pressure continues to be exerted on manufacturers of steel plates for further tonnage. Strong inquiry for railroad cars and unusual activity of shipbuilding concerns bring a heavy demand for this form of finished steel. Practically the only basis on which plate tonnage can be placed is indefinite delivery, probably third or fourth quarter of 1917, and under these circumstances buyers are placing their orders. No advance has been made by the leading interest or the leading independent, and plates are still quoted at 3.19c, Chicago, on such business as is being placed for remote delivery.

New Factory Building.—W. W. Hodges, architect, Schofield building, Cleveland, is preparing plans for a new factory building to be located at Superior avenue, corner East Twenty-fifth street. The building will be 268 feet front by 150 feet deep, four stories, with basement, and will be made of reinforced concrete. It will cost approximately $240,000. The owners, Rook & Bernstein, Cleveland, hope to have it completed by June 1, 1917, and will let the contract within a few weeks. The building will have four elevators, seven stairways, steel sash windows, an automatic sprinkler system, and many other modern improvements. It will be occupied by clothing makers.

(*For complete prices see page* 924.)

Ferro Prices

Show Some Variation—English Makers Not Getting Large Orders

New York, Oct. 31.—A leading eastern Pennsylvania steelmaker has inquired for 3,000 to 6,000 tons of 11 to 12 per cent bessemer ferro-silicon for shipment over the first half of 1917 to his several plants. Some doubt is expressed whether so large a tonnage can be obtained in view of the fact that makers have heavy order books.

Price spread continues to be shown in the ferro-manganese market. Small sales of domestic metal in the east at $165, delivered, and also at $165, furnace, are noted, but on attractive lots, it is understood that some of the steel works producers will do $162.50, and perhaps lower. Several of the other domestic makers are reporting that they are holding firmly for $165, delivery. There is very little new business moving and English makers are getting but a small proportion of it at their unchanged quotation of $164, seaboard. Consumers continue to hold back in placing contracts for the first half of 1917 and it is estimated by some sellers that less than 25 per cent of the requirements for that period have been covered.

Spiegeleisen seems somewhat firmer, although new sales have been few and from $43 to $45, furnace, for 60 per cent, is being named. On small lots of 50 per cent ferro-silicon, $95, furnace, has been quoted by some makers and this metal shows a spread of from $95 to $100, furnace, or Pittsburgh.

Spiegel Sells at $45

Pittsburgh, Oct. 31.—Several prominent consumers in western Pennsylvania and eastern Ohio have paid $45, furnace, for spiegeleisen for delivery the first three months of 1917. That figure is $5 a ton above what had been regarded as the minimum market price. Demand for spiegel is described as heavy. Sellers do not appear willing to accept contracts for delivery after March 31. Eighty per cent ferro-manganese still is quoted at from $162 to $166, furnace. Advanced prices of lower grades of bessemer ferro-silicon have been established on the basis of $33, furnace, for 10 per cent material.

Bars Are Strong

But Prices Vary Considerably—Mills Filled with Orders

Philadelphia, Oct. 31.—Small lots of steel bars for early delivery are being sold by independent makers at 3c, Pittsburgh. Specific orders for limited amounts for shipment at the convenience of the mill also are going at 2.70c, Pittsburgh, or 2.859c, Philadelphia, and some of this business was closed in this territory during the past week. The 2.70c, Pittsburgh, price represents the market's minimum. Some makers are asking 2.80c in instances, and one, 2.85c. In several cases, these prices are purely nominal, however, as the mills are seeking little new business and such orders as they feel impelled to accept from regular customers usually are required to be of specific form. Specifications against old contracts are active. The Pennsylvania railroad still is in the market for 1,500 to 2,000 tons of bars for this year's specifications.

Prices Vary

Buffalo, Oct. 31.—Producing interests are not agreed on prices being quoted in the face of the increasing demands for material. The spread appears to be 2.70c to 2.85c base. Mills and agencies report that they are being offered more tonnage than they have been able to accept, in fact, have turned down without quoting upon the business fully three times the tonnage taken.

Western Bars Not Advanced

Chicago, Oct. 31.—Although announcements have been made from the east of a general advance of $2 per ton on bars, shapes and plates, which would bring bars at Chicago to 2.70c, no such figure has been made by the leading interest or others with plants in the west. The quotation available today in Chicago is 2.60c, Pittsburgh, for bars, 2.70c, Pittsburgh, for shapes, and 3c, Pittsburgh, for plates.

Conditions in the soft steel market do not change and the only drift possible to observe is a greater anxiety on the part of consumers to place business, and less heed is being given to prices, the placing of the contract apparently being the most important consideration.

Chicago Bars Higher

Chicago, Oct. 31.—Selling of bar iron in this market appears to be somewhat irregular. The only point on which sellers agree is that nothing is being placed at less than 2.40c, Chicago mill. This minimum quotation apparently is being made only on occasional unusually attractive business, while the bulk of sales is at 2.45c, Chicago mill, and some sales have been made at 2.50c, Chicago.

Some interests have sold comparatively large tonnages over first half of 1917, and much of this was placed while the market was at 2.35c. Other sellers have reserved their tonnage and obtained a better price, and most of them still have much first half iron to be sold at present quotations or whatever the future may offer.

Demand for bar iron is holding well, although recent heavy sellings has taken many consumers out of the market, who will not need further supply for several months. The rapidly increasing price of steel scrap is running up the cost of making bar iron, and this is hardly being balanced by the slight advances made by bar manufacturers.

Spread of $2

New York, Oct. 31.—A spread of $2 a ton in bar iron prices continues to be shown among eastern mills. Some of them are quoting 2.50c, Pittsburgh, while others still will do 2.40c. The demand for bar iron continues very heavy.

Hoops and Bands

Pittsburgh, Oct. 31.—In consonance with recent advances in prices of plates and bars, steel hoops and bands have been put up to 3.25c and 2.70c, respectively, for shipment at the convenience of the mill. Most mills cannot promise deliveries in less than from six to nine months and consumers say no tonnage is available for prompt delivery. Warehouses are enjoying a heavy demand for both hoops and bands.

Policy as to Shafting

Pittsburgh, Oct. 31.—Cold rolled steel shafting is being offered at a range from 10 to 20 per cent off the list for future delivery. Some mills are selling only for delivery the remainder of this year, others have accepted orders for first and second quarter shipment, and in some instances consumers have obtained material for delivery after July 1, by buying tonnage for delivery at the convenience of the maker. For prompt shipment, the list price frequently is being paid.

Cold Rolled Strip Steel

Pittsburgh, Oct. 31.—Some manufacturers have opened books for delivery the first half of 1917 at 6.50c, base. Demand for first and second quarter shipment is described as heavy. For delivery this year, mills have made no changes in previously prevailing quotations, which range from 6c to 6.50c, base.

(*For complete prices see page* 924.)

Ore Movement

Is Retarded by Car Shortage, But is Heavy

Cleveland, Oct. 31.—An inadequate supply of cars at lower lake docks has retarded the ore movement to some extent, but it still seems probable that the shipments from the Lake Superior region for October will amount to 8,500,000 tons as compared with 7,146,873 tons shipped in October, 1915, which was the record for any October up to that time.

The subject of ore prices for next year has not received any formal attention during the past week and ore sellers are hoping that the consideration of prices can be delayed until it is definitely known what the ore carrying rate for 1917 will be. Some ore sellers have contracted for vessel capacity for the last trip of the year at $1 from the head of the lakes, which is considered better than storage of grain at 5 cents.

Advance of Dollar

Philadelphia, Oct. 31. — A small lot of old range bessemer ore for this year's delivery has been sold to an eastern Pennsylvania consumer at $5.45, at lower lake ports, or $1 a ton above the present season's schedule. Eastern representatives of lake ore interests state that further sales could be made at such a price for this year's shipment were the ore obtainable.

Wire Advance

Is Again Expected—Conditions are Very Strong

Pittsburgh, Oct. 31.—Although leading manufacturers of wire products put up prices $2 a ton, Oct. 18, another advance appears imminent. In fact, it frequently is predicted that wire nails will command $3 a keg or above before July 1, next. Wire nails have not been quoted at $3, or above $3 a keg, since the early part of 1900, when the John W. Gates' interests, in an effort to stimulate specifications, put up quotations to $3.20 a keg. The market shortly afterwards dropped like a parachute, $1 a keg, to $2.20. However, fundamental conditions today are much stronger than they were in 1900 and sellers do not believe they would experience much difficulty in selling wire products on the basis of $3 a keg for nails. Several manufacturers have advanced prices of wire fencing one point to 58 off.

W. C. McCain, superintendent of the blooming mill of the Pittsburgh Crucible Steel Co., Midland, Pa., resigned his position Nov. 1.

Few Awards

Of Structural Contracts—Mills' Conservative Policy

Philadelphia, Oct. 30.—Further sales of structural shapes are being made by eastern Pennsylvania makers at 2.85c, Pittsburgh, or 3.009c, Philadelphia, and these have included several first quarter contracts with the fabricating trade. Some fabricators now want to place contracts for the second quarter of next year, but the producers are going slowly. Early shapes are commanding 3c, Pittsburgh, in instances. Ship shapes are at 3.50c, Pittsburgh. Certain of the larger independent producers are not promising deliveries on new shape orders at present under five to six months. This does not mean that their shape mills are filled up for that period, but that the pressure on their crude steel supply is so intense. The Southern railway is in the market for 2,000 to 3,000 tons of shapes for car construction at Lenoir City, Tenn. New fabricated steel inquiries are light, a revised 3,000 ton hotel project at Washington being the largest.

Shapes Held at 2.80c

Pittsburgh, Oct. 31.—As briefly reported by wire a week ago, the Carnegie Steel Co. advanced its price of structural shapes $2 a ton to 2.80c, although the general trade was not advised of the change until yesterday. Independent manufacturers are quoting structural shapes at 2.80c and above for delivery at their convenience. Specifications against contracts are coming out in heavy volume and new buying continues active. Several new structural undertakings are being considered in this district.

Structural Demand Less

Chicago, Oct. 31.—Structural business seems to be on a somewhat lower scale than has been the rule during the early autumn. Projects closed in the west recently involve nothing approaching 500 tons, and most are for much less. The quotation remains at 2.89c, Chicago, expected advances not materializing last week.

CONTRACTS AWARDED.

Arkansas & Memphis Railway Bridge & Terminal Co., extension of wagon approach on Arkansas side, 370 tons, to Virginia Bridge & Iron Co.

Crawford Trust Co., theater building, Chicago, 241 tons.

Extension to the McAlpin hotel, Thirty-third street, New York City, 1,300 tons, to the Bethlehem Steel Co.

Building for the Consolidated Gas Co., Fifty-seventh street, New York City, 250 tons, to the National Bridge Co.

Addition to the plant of the New Departure Mfg. Co., Bristol, Conn.; 300 tons, to Levering & Gerrigues.

Building for the Vacuum Oil Co., Paulsboro, N. J., 250 tons, to an independent shop.

Extensions to open hearth steel plant of the Youngstown Sheet & Tube Co., Youngstown, O., about 5,000 tons, to McClintic-Marshall Co.

CONTRACTS PENDING.

Building for a State Normal School, Pottsdam, N. Y., 250 tons, bids pending.

Office building, Holyoke, Mass., 700 tons, bids pending.

Extensions to the plant of the General Electric Co., Lynn, Mass., 750 tons, bids pending.

Department store, Richmond, Va., 500 tons, bids pending.

Arlington Hotel, Washington, D. C., about 3,000 tons, revised bids taken.

Column cores for a new factory for the Crown Cork & Seal Co., Baltimore, about 500 tons, bids being taken.

Billet Sales

Are Not Numerous—Large Tonnages of Discards are Offered

Philadelphia, Oct. 31.—Pittsburgh district steel makers have invaded the east in force with offers of heavy tonnages of shell steel discards and with the quantities of this material available from the plants in this territory, the market is flooded. One of these Pittsburgh sellers has been circularizing the trade. An eastern maker is offering 3,000 to 4,000 tons and another 2,000 tons tons monthly. Prices as a result of the tonnage in sight have softened and down to $30, mill, now is reported. Some of the eastern works have been quoting $35, mill.

Semi-finished steel sales are light and in small quantities. Those eastern mills which are regular sellers of such product, can take on no new business of importance this side of July. The buyers are cautious as to closing beyond that date and the producers themselves are not anxious to push extended future sales. As gaged by small business, rerolling billets are from $50 to $55 and forging billets from $65 to $75, eastern Pennsylvania mill. Export inquiry continues to go begging. A request for 20,000 tons of billets from Italy is in the market. The government has been taking numerous shell forging bids at the Frankford arsenal. The American-British Mfg. Co. is low at $1.50 and $1.60 each on 130,000 3-inch; the Worthington Pump & Machinery Corporation, at $3.10 each on 50,368 3-inch, and the Bethlehem Steel Co. at $4.20 each on 32,360 15-pounder forgings.

Record-Breaking Rates

Youngstown, O., Oct. 31.—Production of steel in this district is being maintained at a record-breaking rate. The prediction is freely made that the output in the present quarter will be the heaviest of the year. Despite the heavy production, none of the steel mills has any semi-finished steel to sell. Orders now on the books will take the maximum output for months and sales for spot delivery are infrequent. In the absence of any selling tests, the market is quotable at $50 for both bessemer and open-hearth sheet bars and billets. The coal situation is engaging the serious attention of mill managers. The supply now on hand in this district is sufficient for a few days only and stockpiles are being reduced. The mills have not yet shut down any part of their plants, but any aggravation of the situation may cause operations to be curtailed somewhat.

Billet Inquiry Pending

Pittsburgh, Oct. 31.—The Potter Title & Trust Co., Pittsburgh, probably representing eastern interests, has just sent out inquiries for 45,000 tons of billets for delivery in April, May and June of next year. Since prospective sellers are asked to quote on British specifications, it is believed that the material involved will be shipped to England. Both billets and sheet bars for domestic delivery are being held at $50, mill, at both Pittsburgh and Youngstown. Some tonnage already has been sold at that figure for delivery the remainder of the year. Several fairly heavy tonnages of wire rods have been sold at slightly above $60, Pittsburgh. The market now is quotable at a range from $60 to $65, or $5 a ton above the previously prevailing minimum price.

Tin Plate Shortage

Large Buyers Have Difficulty in Placing Orders.

Cleveland, Oct. 31.—That there will not be enough tin plate to meet the demand for the first half of the year is becoming more clearly apparent. Some of the largest buyers are having much difficulty in getting mills to take their orders and the independents have no difficulty in booking business at $6 per base box.

Heavy Foreign Inquiry

A large tonnage of tin plate for foreign delivery is being held off by producers until their domestic customers are covered. While the bulk of the contract tonnage has been closed, some of the domestic buyers have not bought for delivery in the first six months of 1917 and producers are anxious to supply their regular trade before taking on foreign business. It is understood that one buyer is now in New York ready to place 500,000 base boxes for account of a Scottish buyer.

The tin plate market has stiffened and some mills are now quoting $6.50 for domestic business and up to $7 on foreign orders.

(*For complete prices see page* 924.)

Scrap Prices Are Climbing

Car Shortage An Important Factor in Bringing Out Much Higher Quotations in Leading Centers

Chicago, Oct. 31. — Although present levels on iron and steel scrap are much above anything experienced in a long time, there seems to be no stop in the advance and each day brings out new figures on many commodities. One factor having a great influence on the scrap market is the decided shortage in freight cars, which is limiting the tonnage of scrap offered by railroads and also is making it difficult for dealers to ship readily. This probably will result in an excess of scrap when cars become available, but at present it is assisting in bringing about a small famine.

Rerolling rails are quoted at $21 to $22 and are almost unobtainable. Railroads are offering few, and mills are fortunate in having a sufficient reserve to carry them. Railroad wrought is advancing steadily and is quoted now around $19, while busheling has reached about $16. Heavy melting steel and other forms of scrap of similar kind are being quoted now up to $18 and are somewhat difficult to obtain.

Offerings of railroad scrap this week are small. George W. Jennings & Co. offer 1,100 tons, the Santa Fe railroad 4,000 tons, and the Monon railroad 700 tons.

All are Excited

Buffalo, Oct. 31.—Dealers and consumers alike in the past few days have become excited over the market situation. Sharp advances in prices are noted in low phosphorus, railroad wrought, railroad malleable, old iron rails steel and iron axles, and several other commodities in the list. Dealers who found themselves caught short have endeavored to cover and have been forced to pay prices well over the quoted schedules. There appears to be a shortage of steel and cast scrap and further advances in prices are expected.

Strong at Cleveland

Cleveland, Oct. 31.—An exceptionally strong market in iron and steel scrap is in evidence here and dealers are having a hard time to buy material for delivery on old or new orders. Holders of stocks do not care to sell at the moment; they even attempt to escape negotiations for sales, believing perhaps that a wait will bring higher prices. The market here is being etsablished largely by dealers who are covering.

No. 1 busheling has been in demand by consumers who are offering higher bids than last week. Almost every grade has taken on gains during the week; exceptions resting altogether in the lighter grades such as bundled sheets and steel turnings. Offers of $19, Canton, are heard for heavy melting steel, but mills in Cleveland are not showing interest in the present situation.

Old rails are perhaps taking the cream of the present business. Relayers are scarce and re-rollers and uncut rails not fit for rerolling are bringing top notch prices. A sale of steel car axles at $41 a gross ton, this city, has been made. That the present rise is due to demand and speculative holding of material is indicated by the lack of talk about scarcity of scrap.

Reflects Further Strength

Pittsburgh, Oct. 31.—Youngstown consumers have paid $19.75 this week for heavy melting steel and sales at as high as $20.50 are reported in the St. Louis district. The market for this grade at Pittsburgh is quotable at a range from $18.75 to $19.25. Bundled sheet scrap has advanced to $13.25 and No. 1 wrought is commanding $15.50. A railroad embargo against the shipment of scrap to the plant of the American Rolling Mill Co., Middletown, O., has been declared by railroads.

Prices Marked Up

Philadelphia, Oct. 30.—Consumptive buying by practically all classes of plants and for all grades except heavy melting steel has put up scrap prices in this district 50 cents on the average during the past week. Wrought scrap has been especially active. Heavy melting steel remains the laggard grade since the eastern works all are well covered and at Coatesville the freight embargo remains in effect. The brokers still are buying steel in the east in liberal quantities for shipment to Pittsburgh and have paid $16.50, Philadelphia. The government sold 500 tons of steel and wrought pipe from the League Island navy yard, obtaining more than $17 for the former grade.

Advances at Cincinnati

Cincinnati, Oct. 31. — Advances of $1 per gross ton have occurred on all grades of heavy steel scrap since last week. Heavy melting scrap is now given from $16 to $16.50 per gross ton. The lighter materials such as No. 1 yard wrought and No. 1 busheling have also advanced $1 per net ton, the former being given from $13.75 to $14.25, and the latter from $12.75 to $13.25 per net ton. Borings and turnings continue weak. Rolling mills are offering only $7.50, per gross ton, delivered, for heavy turnings, which is a reduction of 50 cents per net ton from the price that prevailed last week. Cast borings are weak at $4.75 to $5.25 per net ton. The reason given for this condition is that the supply of borings and turnings is larger than consumption. No. 1 railroad wrought has advanced sharply, being quoted from $15 to $15.50 per net ton. The outlook in the market is very optimistic.

Excited at St. Louis

St. Louis, Oct. 31.—The scrap market is excited in this district, and advances are noted all along the line. All of the larger consumers are actively bidding for material, but dealers are disposed to their accumulations wherever possible. If the present favorable weather continues a few weeks longer, it is believed that the railroads will dump large tonnages on the market at the prevailing high prices, which should have a tendency to hold prices in check.

Scarcity in South

Birmingham, Ala., Oct. 31.—It looks as though some interesting developments are due in the old material market. The only feature that withholds a present advance is the fact that sufficient cars are not obtainable to handle surplus material—there only being enough cars available for the shipment of material on already existing contracts. Pig iron at $17 per ton means an equivalent of $15.50 to $16 per ton for No. 1 machinery scrap. Great scarcity is being felt in all lines of scrap material.

(For complete prices see page 924.)

Bessemer Average

Is Highest in Decade—American Steel Foundries Buys Basic

The average price of bessemer and basic pig iron in October was $23.6576 and $20.3086, valley, respectively, according to compilations made by W. P. Snyder & Co. Bessemer average is the highest reported in more than a decade. In May, 1907, the monthly average price of basic pig iron was $23, valley. Compared with average prices for September, bessemer pig iron last month advanced $1.723 and basic advanced $1.6786. Averages are based on sales of 1,000 tons or more. Some $22 basic iron and some $26 bessemer iron figured in the computation.

The American Steel Foundries paid $22, valley for 5,000 tons of basic iron for shipment to plants in this district. Both basic and bessemer iron likely will advance to $23 and $27, respectively, this week.

Tool Builders Prepare for Future

National Convention in New York Faces Coming Months With Optimism, But Speakers Declare That Precautions Must be Taken to Maintain and Insure the Business Stability of Their Industry

OPTIMISM tempered with careful appraisal of the future characterized the fifteenth annual convention of the National Machine Tool Builders Association at the Hotel Astor, Oct. 24 and 25. The largest gathering of members in the history of the organization was registered.

Optimism was in evidence throughout the opening session; this feeling was expressed strongly by J. B. Doan, of Cincinnati, president of the association, who predicted many more months of unprecedented prosperity. He pointed out, however, that now is the time to consider the future when the present heavy demand from munition makers will have subsided. In his opinion, the foundation must be laid solidly by close co-operation on the part of all builders.

European competition in machinery, both in foreign and domestic markets, is to be guarded against after the war, said Mr. Doan. He described the enormous expansion during the past two years in the American machine tool industry, as the result of the extraordinary demand from the allied countries for practically every kind of machine tool known to the trade. The struggle of the world has become one of machinery against machinery, whether in war or in peace, he declared.

"Our lathes, our turret machines, our planers, our milling machines, our fine mechanical devices of every nature are the war weapons of civilization. We represent a great industry. We manufacture the mechanism which keeps men always at the topmost point of civilized development. It is a great honor to be a builder of good machine tools, but it is more than an honor, it is a national responsibility, that the machine tool builders of America should be the builders of the best machine tools."

Frank F. Dresser, of Worcester, Mass., described the so-called health compensation bills now pending before the legislatures of 22 states of the Union. A special committee was appointed to consider these measures as they affected the owners of tool manufacturing plants.

Meeting in conjunction with the Tool Builders' Association was the machinery section of the National Supply and Machinery Dealers' Association, the members of which act as distributors for the builders. H. W. Strong, president of the association, opened the session and introduced W. J. Radcliffe, of Cincinnati, as chairman. Henry Prentiss, head of Henry Prentiss & Co., Inc., New York City, said that while many competent judges believe the end of the war will be followed by a sharp depression, resulting in receding prices, he was hopeful of the future.

"As our country has accumulated vast resources," he said, "the fruitage of the great prosperity of the last two years, the consequent demand upon them, together with the growing needs of our railroads and shipbuilding plants to supply adequate transit facilities on land and water, for our expanding domestic and foreign trade, should be important factors in restoring prosperity, should the prediction of depression prove true."

The Giant Bellows

"We might picture business in America as a great force made white hot, as the demand from Europe has blown upon it like a mighty bellows. The anvils have rung, the workers have toiled and still the cry has been for 'more, more'. But this Hercules of war will grow weary. The giant bellows will lose their force. Will there then be a sufficient demand to keep all busy? America wants and needs all the prosperity it can get, so in the midst of unprecedented prosperity let us not forget to prepare for other days."

(The foregoing paragraph is not from the pen of a professional word painter, but is an extract from J. B. Doan's speech to the convention.)

The concluding session of the National Machine Tool Builders' convention, held at the Hotel Astor, New York City, Oct. 24 and 25, was featured by a masterly address by James A. Emery. Mr. Emery carefully analyzed current industrial conditions, and especially those that have a bearing on the future of business as a whole after the war. That industry in this country is paying a heavy toll for the prosperity it is enjoying is reflected in the enormous wage rates which are being paid, the reduction in the number of hours per working day and other recently developed factors, Mr. Emery said. In fact, the tendency is toward increasing wages and decreased efficiency. That this tendency will lead to lamentable results following the conclusion of the war, Mr. Emery said, is not to be doubted. He spoke of the successful ufacturers do all they can to increase the efficiency of workers, and alluded to the desirability of cooperation between employers and employes to achieve results which will enable us to hold our own in the industrial battle to come.

Class Legislation Condemned

Mr. Emery greatly deplored the recent action of congress in passing the 8-hour law, saying that aside from the class legislation involved, the most harmful feature was the surrender by congress of its deliberative function, since the act was passed entirely at the dictation of labor and without any consideration by congress. The future will prove, Mr. Emery said, that it would have been far less costly to the nation to suffer the disaster which would have been entailed in a halting of transportation, than to submit to the establishment of such a precedent.

Election of Officers

Officers of the association were reelected for the coming year as follows: President, J. B. Doan, American Tool Works Co., Cincinnati; first vice president, D. M. Wright, Henry & Wright Mfg. Co., Hartford; second vice president, August H. Tuechter, Cincinnati-Bickford Tool Co., Cincinnati; treasurer, A. E. Newton, Reed-Prentice Co., Worcester, Mass.; secretary, Charles L. Taylor, Taylor & Fenn Co., Hartford; general manager, Charles E. Hildreth, Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. The following concerns applied for membership and were accepted: Fitchburg Grinding Machine Co., Fitchburg, Mass.; Cincinnati Grinder Co., Cincinnati; Nutter & Barnes Co., Hinsdale, N. H.; Sipp Machine Co., Paterson, N. J., and W. W. & C. F. Tucker, Hartford. The association selected Cincinnati for its next convention, which is to be held May 21 and 22, 1917.

John M. Thomas, president Thomas Furnace Co., Samuel H. Squier, secretary Pawling & Harnischfeger Co., and William S. Smith, treasurer and general manager Northwestern Mfg. Co., Milwaukee, have been elected directors of the Milwaukee Automobile Insurance Co., Milwaukee.

MEN OF MACHINERY TRADE

Who they are **Where they are** **What they are doing**

GEORGE W. HOYT, production manager and engineer, Bour-Davis Motor Car Co., has resigned from that position to become chief engineer of the Harroun Motors Corporation. Mr. Hoyt will have charge of the production and engineering departments. Mr. Hoyt was formerly associated with Mr. Harroun in the engineering department of the Maxwell Motor Co. and the Nordyke & Marmon Co., Indianapolis.

E. J. Parker, manager of the New York office of the Morgan Engineering Co., Alliance, O., returned from London, Oct. 23, on the steamer NEW YORK.

Cyrus W. Bassett, formerly connected with the Elevator Supply & Repair Co., Chicago, has become affiliated with the Budd Mfg. Co., Philadelphia.

Charles E. Beck has opened an office in the Victor building, Kansas City, Mo., as district manager for the De La Vergne Machine Co., New York.

George L. Hoyt, formerly superintendent of the George W. Swift Machine Works, Bordentown, N. J., has resigned his position with that company.

Ross Anderson, manager of production of the Poole Engineering & Machine Co., Baltimore, has assumed the position of general manager of the shop.

John A. Malone, recently connected with the E. W. Bliss Co., Brooklyn, N. Y., has accepted a position with the Allied Machinery Co. of America, New York City.

John B. Price, formerly identified with the Price Electric Machinery Co., Richmond, Va., has become associated with the Peerless Electric Co., Warren, O.

Merritt Van Valkenburgh, formerly connected with the De La Vergne Machine Co., New York, is now associated with Westinghouse, Church, Kerr & Co., New York.

Samuel P. Blakeman, until recently associated with the Terry Steam Turbine Co., Hartford, Conn., has joined the engineering staff of the S. K. F. Ball Bearing Co., Hartford, Conn.

H. Schreck has been appointed chief engineer of the Diesel engine department of the Fulton Iron Works, St. Louis, Mo. Mr. Schreck has had a wide experience with a prominent manufacturer in Europe in whose shops he superintended the manufacture of the Diesel engine, participating as a co-worker in its development both in the marine and the stationary type.

Joseph Spring, formerly connected with the Aurora Automatic Machinery Co., Aurora, Ill., has been promoted to the position of superintendent of the Chicago plant.

S. M. Marshall, manager of the turbine department of the Southwark Foundry & Machine Co., Philadelphia, has been appointed chief engineer of that company.

Howard Riddle, consulting engineer of the Ohio board of administration, Columbus, O., resigned Oct. 1, to accept a position with the Jeffery Mfg. Co., Columbus.

Eugene E. Hart recently connected with the Chicago office of Pratt & Whitney Co., has taken a position as machinery salesman with the Cleveland Tool & Supply Co., Cleveland.

T. V. Buckwalter, formerly of the engineering department of the Pennsylvania railroad, Altoona, Pa., has been appointed chief engineer of the Timken Roller Bearing Co., Canton, O.

Robert C. Miller has been appointed purchasing agent for the Staten Island Ship Building Co., New York, to succeed W. H. Moore, who has retired from active business.

A. Dietzel, formerly purchasing agent for Mackintosh, Hemphill & Co., Pittsburgh, has resigned his position and become associated with C. H. Lobsey, Pittsburgh.

Frank L. Eidmann, formerly efficiency engineer with the American La France Fire Engine Co., Elmira, N. Y., has resigned to accept a position with the Heald Machine Co., Worcester, Mass.

Harry Kaplan, until recently efficiency engineer with the Lewiston Bleachery & Dye Works, Lewiston, Me., has accepted a similar position with the Winchester Repeating Arms Co., New Haven, Conn.

Barton Cruikshank has been appointed to the position of New York manager of the C. G. Garrigus Machine Co. Mr. Cruikshank was formerly associated with the Ashcroft Mfg. Co., Bridgeport, Conn.

The board of governors of the Machinery club of New York City elected James K. Cullen, president, Niles-Bement-Pond Co., New York, a member of the board to succeed the late Colonel Robert C. McKinney.

Wilbur C. Prior has assumed the duties of chief draftsman of the Merrow Machine Co., Hartford, Conn. Mr. Prior was formerly identified with the Aetna Life Insurance Co., Hartford, Conn.

E. R. Kenner, formerly sales manager for the Allis-Chalmers Mfg. Co., Cleveland office, has resigned and entered the engineering department of the Firestone Tire & Rubber Co., Akron, O.

Lee E. Walker has accepted a position as foreman with the Baldwin Munition Co., Eddystone, Pa. Mr. Walker was formerly connected with the Good Roads Machinery Co., Philadelphia.

George A. Kellar has been elected head of the contract department of the P. & F. Corbin Co., division of the American Hardware Corporation, New Britain, Conn. Mr. Kellar succeeds A. F. Eichsteadt, recently resigned.

Announcement is made by the Huessener Engineering Co., Pittsburgh, of the appointment of M. William Nolan as field engineer. Mr. Nolan was formerly connected with the United States navy engineering department at Washington.

Charles H. Phillips has resigned his position as tool designer for the Pierce-Arrow Motor Co., Buffalo, N. Y., and has accepted a position with the Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., in the capacity of superintendent of tools.

B. D. Gray, by action of the board of directors of the Hess-Bright Mfg. Co., succeeds F. E. Bright as president of that concern. Mr. Bright will remain identified with the company in the position of chairman of the board of directors.

E. W. Chadwick, formerly connected with the Buffalo office of the Manning, Maxwell & Moore, has become associated with the Cleveland office of that company, taking the position vacated by D. A. Hamilton, recently resigned.

Leo C. Steinle, representing the Steinle Turret Machine Co., Modern Tool Co. and several other well known tool builders, is now in England where he will open an office for handling sales of machine tools to Great Britain and France.

Coke Very High

Furnace and Foundry Grades Sold at More Than $8

Pittsburgh, Oct. 31.—After touching the $8, ovens, mark, Connellsville furnace coke has declined to about $7, a ton. An eastern consumer last week paid $8, ovens, for 100 cars of 48-hour fuel for nearby delivery. Cokemakers appear to be anxious to hold the market at about $7, ovens. A consumer in an adjacent territory has closed for 10,000 tons of furnace coke a month for shipment all of next year at $3.75, ovens. Foundry coke for immediate delivery is commanding from $8 to $8.25; for future shipment, sales have been made at a range from $4.50 to $5, ovens. Reports that the spectacular rise of the market for spot furnace fuel has been caused by the activity of jobbers, appear to be without foundation, since the bulk of the tonnage sold recently has been purchased direct by consumers in this and eastern territory. *The Connellsville Courier* for the week ending Oct. 21, says production was 398,096 tons, compared with 404,806 tons the week before.

Sales in the East

Philadelphia, Oct. 31.—A sale of five cars of Connellsville furnace coke for spot shipment was made to an eastern Pennsylvania consumer during the week at $8.25, ovens. This is the highest price yet reported in the east. Other sales of spot furnace coke were made to eastern buyers at $7.50, ovens, and further lots are being offered on this basis. Spot foundry coke was sold in this district within the week at $8.50 and in New York territory at $8.25 and $8.50, ovens. First half foundry contracts were taken at $6. Some of the eastern furnaces still are suffering from coke shortages and enforced banking of stacks from time to time continues. In central Pennsylvania run of the mine coal has sold at $4.50, at the mines. Eastern buyers have paid $6.75 for run of mine western Pennsylvania coal and $5, for slack. The American Locomotive Co. has inquired for 15,600 tons of foundry coke for its various plants for delivery over the first half of 1917.

Uncertain at Cincinnati

Cincinnati, Oct. 31.—No definite prices are available on either furnace or foundry coke. Operators are showing a decided preference for selling coal direct rather than turn it into coke. At the present price of coal, which is between $3 and $4 a ton at the mines, a larger profit can be realized than from coke if it were to be sold as high as $6 or even $7 a ton, ovens. The car shortage is very acute, and that is one reason for the price of coal being so high. In a large number of cases, shipments cannot be made because of the scarcity of cars, and some railroads have even refused to allow their cars to be taken off of their own lines. Nominal prices given for Wise County and Pocahontas furnace coke for contract shipment run between $4 and $6 per ton, ovens. For foundry coke the nominal price is between $4.75 and $6, ovens.

Smelter Coke

St. Louis, Oct. 30.—There is an inquiry in this market for 10,000 tons of smelter coke, and prices on all grades of coke are in the ascendency. Connellsville foundry grades are firm at $8.50, ovens.

Steel Works

Will Be Built by the Worths and Associates on the Delaware

Philadelphia, Oct. 31.—Options on a tract of about 500 acres of land on the Delaware river near Claymont, Del., which have been held for several months, finally have been exercised by J. Sharpless Worth, W. P. Worth and associates and this ground will be used as the site for a large new steel works which it has been reported at various times these interests have had in contemplation. The tract of ground fronts on the Delaware river and a small stream known as Naamans creek, flows through it. It is located 19 miles below Philadelphia, a short distance from Marcus Hook, Pa., and just over the Pennsylvania state line. No definite announcements have been made by the Worth interests regarding the general character of the new plant or as to how soon their plans call for the beginning of active construction. It is believed, however, that by reason of the former activities of the Worths as plate manufacturers at Coatesville under the name of the Worth Bros. Co., which were discontinued by the sale of their plant to the Midvale Steel & Ordnance Co., the new works will be devoted largely to plate production. Drawings for the new plant have been in preparation for several months and are well advanced. It is understood that some contracts for power equipment and other machinery have been entered into. Associated with J. Sharpless Worth and W. P. Worth, in this enterprise, are the two sons of the latter, E. H. and Wm. A. Worth, who formerly were identified with the Worth plant at Coatesville. Norman R. Entrekin, who was general superintendent of the Worth Bros. Co., Coatesville, is to be general manager of the new works.

(*For complete prices see page 924.*)

Car Inquiry

Is Active in West—Recent Orders Placed.

Chicago, Oct. 31.—Inquiry for freight cars continues strong on the part of numerous railroads, and orders are being placed frequently for large numbers.

At present, the market is entertaining the following inquiries: Union Pacific, 1,500 box cars, 1,000 automobile cars; Illinois Central, 400 ballast and 600 general service cars in addition to the 2,000 gondolas previously reported; Great Northern, 1,000 refrigerator cars, 2,000 box cars; Los Angeles, San Pedro & Salt Lake railroad, 1,000 automobile cars; Missouri, Kansas & Texas, 1,000 stock cars; Burlington railroad, 1,500 box cars; New York Central, 1,000 gondolas in addition to a previous inquiry; Chicago, Indianapolis & Louisville, 500 box cars.

Business placed within the last few days includes 250 refrigerator cars for Wilson & Co., which will be built by the Haskell & Barker Car Co.; 1,000 box cars for the Erie railroad, which will be built by the Standard Steel Car Co., and 750 steel underframes for the Louisville & Nashville railroad, taken by the Mt. Vernon Car Co.

No Delivery Promise

Cleveland, Oct. 31.—On its inquiry for shapes and plates for the construction of 77 locomotives, the Lima Locomotive Co., it is understood, has been quoted the usual price, but without any promise of delivery, mills simply stating that delivery will be made at their convenience. A leading independent company has taken an order for 2,000 kegs of spikes, at $2.75.

Takes Over Standard Chain Co.

The American Chain Co., Bridgeport, Conn., has purchased properties of the Standard Chain Co., Pittsburgh. The latter company was organized in 1900 with a capital stock of $800,700. The company owns nine plants, including the Carlisle Chain Works, Gettysburg Junction, Pa.; the Krein Chain Works, Marion, Ind.; the Krein Chain Works, St. Marys, O.; the Standard Chain Works, Braddock, Pa.; the York Chain Works, York, Pa., consisting of two plants; the Columbus Chain Works, Columbus, O., a chain works at Columbus, O., and a plant at Mansfield, O. The annual production of the company is estimated at 30,000 tons. Offices of the Standard company will be transferred to New York at an early date.

Making Success of Duplex Process

American Steelmakers Have Proved Duplexing is a Permanent Development as is Evidenced by the Rapidly Increasing Production and the Quality of the Steel—Practice at Lackawanna Plant

BY G. B. WATERHOUSE

THE duplex process is commonly understood by steel men to be a combination of the acid bessemer and the basic open-hearth processes. The tonnage of steel ingots made by this process has increased very rapidly during the last five or six years, so that a study of the duplex process, as worked out to meet American conditions, is most interesting. It is the aim of this paper to help in this study by giving a brief and clear description of the process in use at the Lackawanna Steel Co., Lackawanna, N. Y., and to give also an idea of the results obtained.

The plan, Fig. 3, shows the layout of the plant. The acid bessemer department was already in existence when duplexing was decided upon. It contained the two mixers shown, of 250 and 300 tons capacity respectively, four 12-ton converters and 12 cupolas. Eight of these were for melting iron, and four smaller ones for melting the spiegel mixture used when making rail or high-carbon steel. The position of these various parts of the bessemer plant is clearly shown in the plan. After careful consideration of the various possible locations, the open hearth was placed directly north of the old bessemer plant. Two large tilting furnaces were built, shown on the plan as furnaces Nos. 15 and 16. This arrangement makes a comparatively short haul for the blown metal between the converters and the open-hearth furnaces. The iron cupolas Nos. 1, 2 and 3, nearest to the open hearth, were remodeled for the melting of spiegel mixture, and a scale was installed opposite No. 2, as shown in the plan. Since then cupola No. 4 has also been altered for the same purpose, and like the other three, it taps into a ladle standing on the same scale. The transfer track for the blown metal extends far enough into the bessemer plant so that all four vessels can be used to blow metal for duplexing. The plan also clearly shows the position of the checkers, the reversing valves, the flues, the chimney stacks, the Hughes gas producers, four per furnace, the gas mains, and the waste heat boilers. Also at the extreme left may be seen the stripper building. The construction of the open-hearth plant is very massive and strong. Extremely heavy construction has been used for the building, furnaces, and machinery, in order to ensure as far as possible against delays or shut downs due to breakage. The building, housing the two tilting furnaces, is steel throughout and is 352 x 124 feet. It has since been enlarged to take care of eight stationary 100-ton furnaces, and is now 1,038 feet 2 inches long by 124 feet wide. The massive construction is particularly noticeable in the case of the crane runway girders, which have a length of 110 feet, a depth of 12 feet, and weigh about 115 tons each. They may be seen in several of the half-tone illustrations. The extreme length is necessary in order to span the tilting furnaces, which are themselves very long and which are placed along the line of the center columns of the building. This location is shown in the plan, Fig. 3, but is more clearly brought out in the sectional view, Fig. 13, which gives the relation of the furnace, building, and equipment. The crane runway girders are protected, over the furnace proper, by steel shields suspended below the bottom chords.

FIG. 1—BLOWING MIXER METAL IN CONVERTER

The metal from the bessemer plant is brought in the transfer ladle to the open-hearth plant. It is hoisted to the charging floor level by a crane of 75 tons capacity, having an auxiliary trolley of 25 tons. The span is clearly shown in Fig. 13 and is 55 feet 10 inches. For handling the cold material there is a high-type charging machine. The pit side is served by two 65-ton cranes of 58 feet 8 inches span, each with an auxiliary trolley of 35 tons capacity. These 35-ton trolleys are also equipped with a 5-ton auxiliary hoist which is used for tilting the spiegel ladle. At the extreme left of Fig. 13 is shown the pouring platform, and above it the track along which the

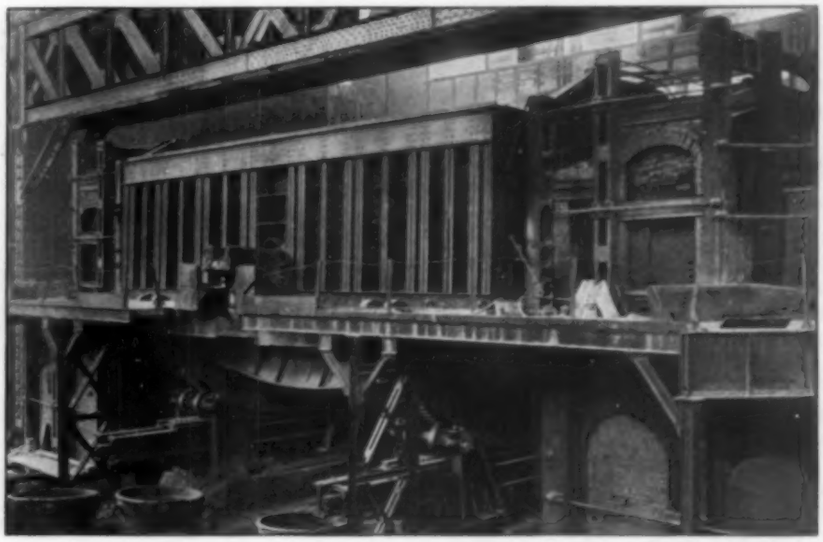


FIG. 2—POURING SIDE OF TILTING FURNACE

Presented at the St. Louis meeting of the American Iron and Steel Institute, Oct. 27-28. The author, G. B. Waterhouse, is metallographist, Lackawana Steel Co., Lackawanna, N. Y.

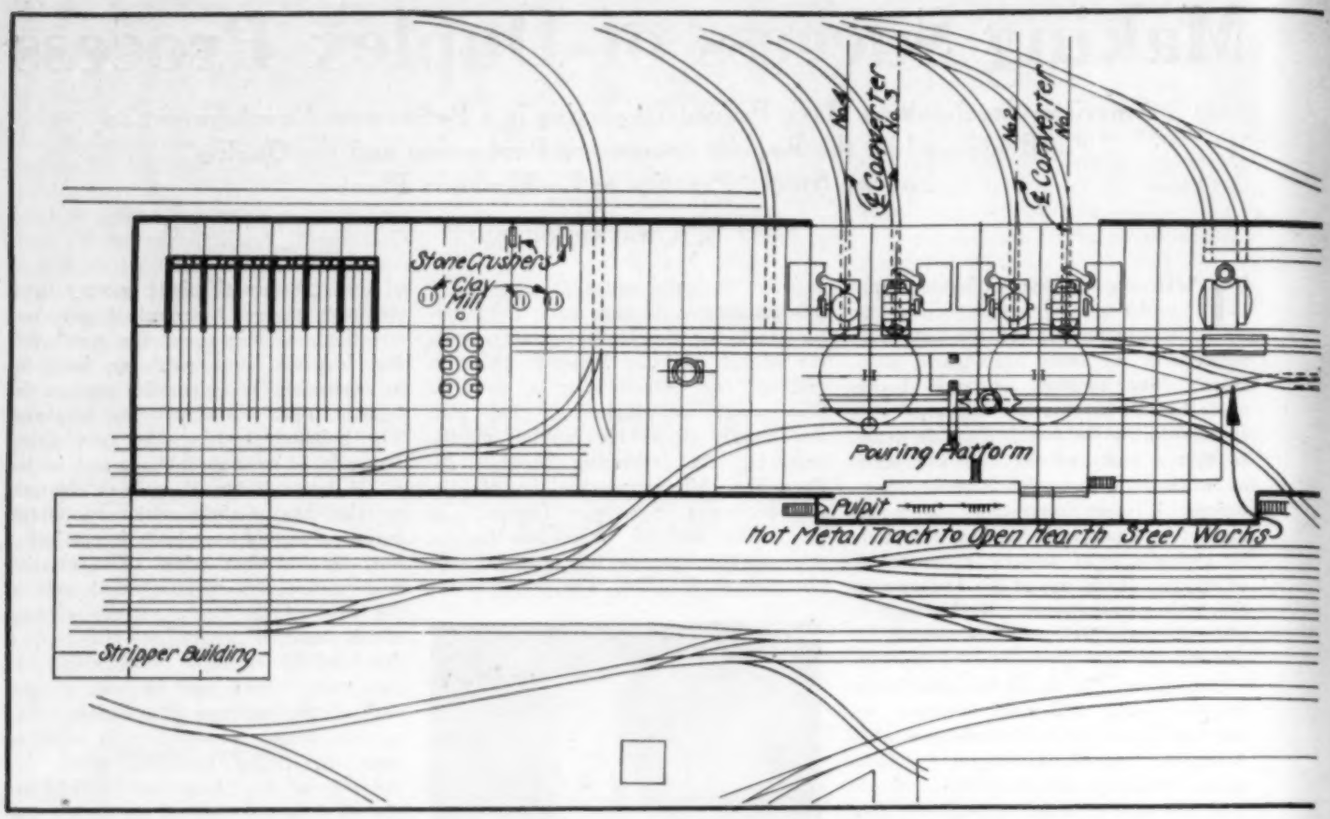
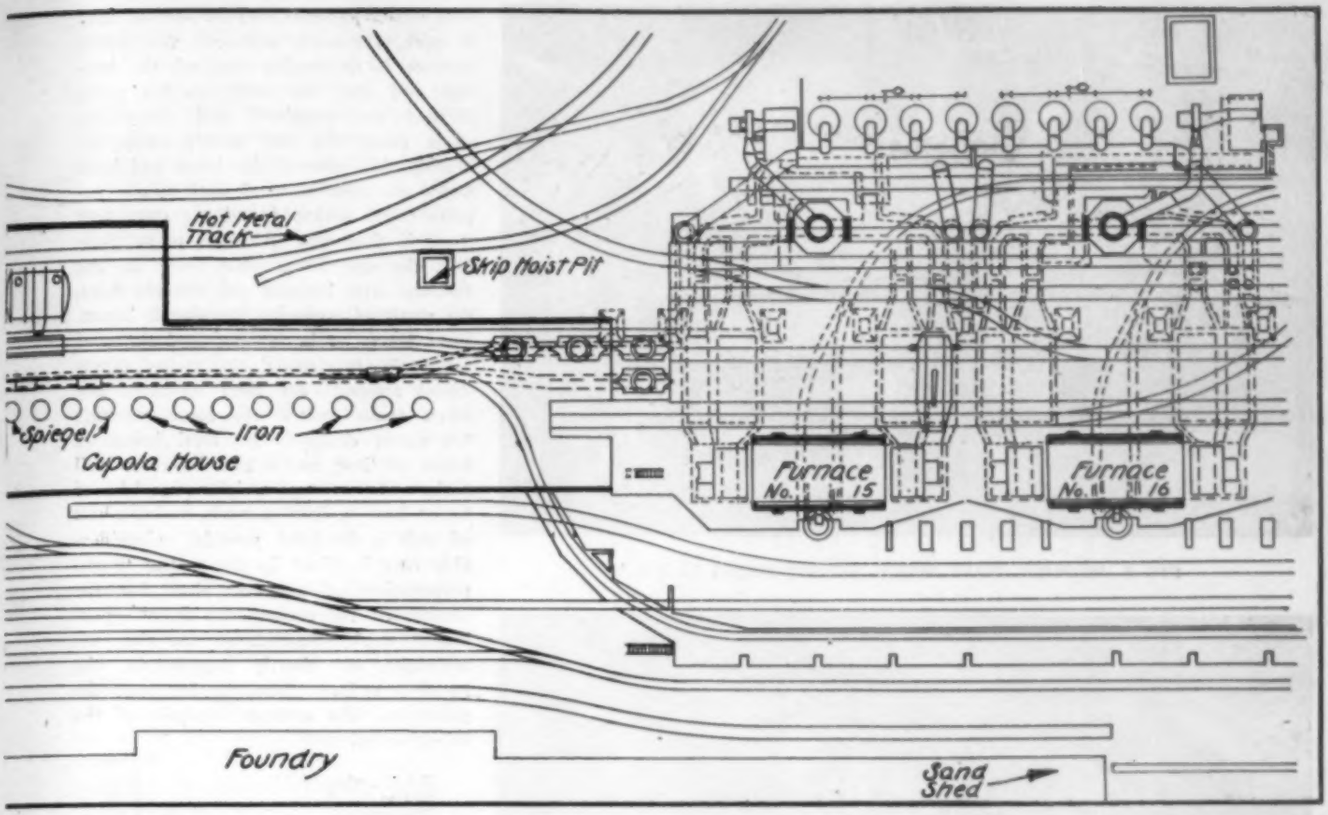


FIG. 3—GENERAL PLAN OF DUPLEXING PLANT OF

spiegel ladle comes from the cupolas. The elevation of this track above the floor level saves valuable floor space. The roof trusses span the entire width of the building, so that no roof load is carried on the center columns or the crane girders, and vibration is not communicated to the roof. A platform for the convenience and safety of the crane operators is provided along the entire side of the building. This platform is level with the floor of the operator's cage, so that he can step directly from the cage to the platform at any point along the runway. The ventilation feature is rather simple, consisting of the usual louvre type of monitor so frequent on mill buildings. It is clearly shown in Fig. 13, where it may be noticed that its size is greater than the average. The width is 41 feet and the height 12 feet from the base of the posts to the bottom chord of the truss.

The furnaces themselves are, of course, the most important part of the open-hearth plant, and there are many interesting features in their construction. In common with the rest of the plant, they were designed and built by the Lackawanna Steel Co., and are of massive construction. The framework consists of heavy beams and channels, suitably tied together and braced. This framework rests upon two heavy box girders, shown clearly in the sectional drawing, Fig. 13, and extending from one rocker casting to the other. These castings are set 30 feet 6 inches, center to center, and rest on heavy I-beam girders, which support the entire weight of the tilting portion of the furnace, including the bath of metal. Fig. 2, which is a photograph of the pouring side of one of the furnaces, shows clearly these girders and their relation to the rocker castings. The girders also form a part of the tilting mechanism and are supported on a series of steel rollers mounted in a massive base casting. This is brought out in Figs. 2 and 13, but is better seen in Fig. 14, which gives the general arrangement of the tilting mechanism. The tilting or rotation of the furnace is accomplished by means of a rack bolted on the I-beam girders, which meshes with a gear segment bolted to the rocker castings. The rack is moved by a steel screw journaled between the I-beams, and held by self-aligning thrust bearings of the ball type, so that no lengthwise motion of the screw can take place. The screws, one for each I-beam girder, are

FIG. 4—HUGHES SELF-CLEANING MECHANICAL GAS PRODUCERS



THE LACKAWANNA STEEL CO., LACKAWANNA, N. Y.

each driven by a 50-horsepower motor, and are cross connected by shafting below the floor level in order to ensure equal movement of each rocker casting, and avoid harmful twisting stresses in the structure and brickwork of the furnace. The furnace may be tilted in either direction, the extremes being 38 degrees travel from the vertical when pouring, and 15 degrees travel toward the charging side when removing slag. The center line of the ports has been made the center of rotation of the furnace, which results in the stationary ports and those in the tilting portion of the furnace always maintaining their proper relation to each other. Cold air is prevented from striking the ports or entering the furnace.

Each furnace has a hearth 13 x 40 feet, and is 50 feet long over the chill plates. On the charging side there are seven doors, as shown in Fig. 5, which is from a photograph of the charging side of the furnace. At the center of the furnace there is a door 2 feet 6 inches by 2 feet 11 inches. On each side are two doors 3 feet by 3 feet 6 inches, those next to the center being equipped with a tapping spout. Also on each side there is a smaller door, near the ports, 2 feet x 2 feet 4 inches Blair water-cooled ports are used, and great care has been used in the construction of the ports so that when the furnace is heated up there is a minimum of clearance between the stationary ports and the tilting part of the furnace, greatly reducing the amount of cold air entering the furnace. The slag pockets and regenerator chambers are of ample proportions, and the binding is unusually heavy and well tied together. The construction of the ports, slag pockets, connecting flues and checkers is shown in Fig. 12, the checker volume for each end of the furnace being 5,388 and 3,084 cubic feet for air and gas, respectively. In conjunction with each furnace there is a self-supporting steel stack, shown in Figs. 3 and 13, 180 feet high, and 7 feet diameter inside the lining. The gas and air reversing valves are water-cooled and water-sealed, and are of the same design as used on all the Lackawanna Steel Co. furnaces. They are 36-inch diameter for the gas, and 48-inch diameter for the air. The fuel for the furnaces is furnished by Hughes self-cleansing mechanical producers, four for each furnace, a photograph of which is clearly reproduced in Fig. 4.

FIG. 5—CHARGING SIDE OF FURNACES

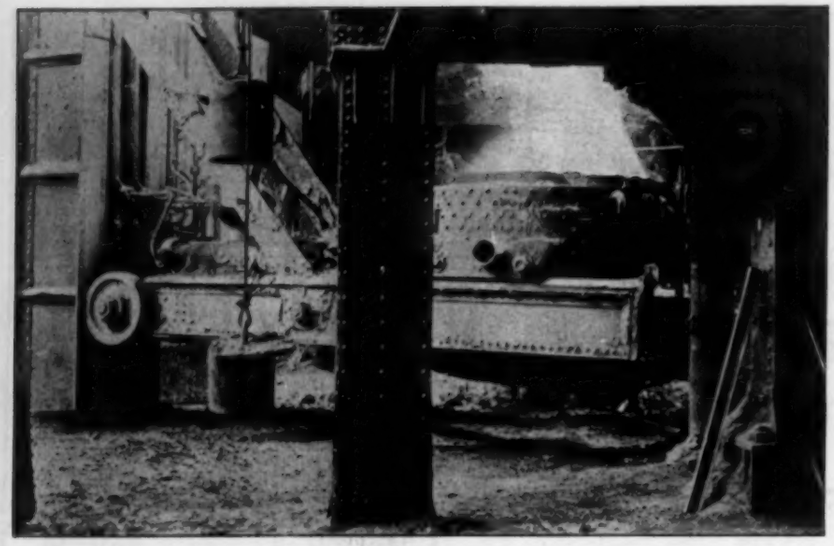


FIG. 6—POURING BLOW METAL INTO CASTING LADLE

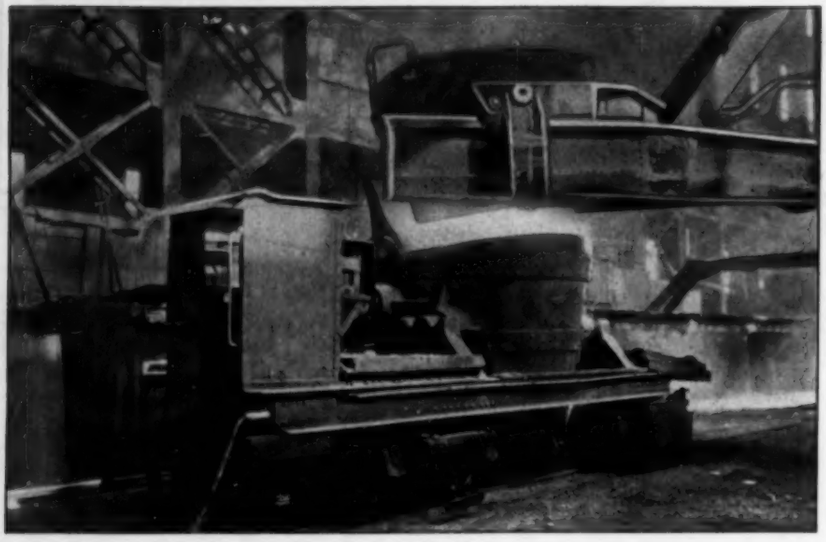


FIG. 7—POURING INTO TRANSFER LADLE

FIG. 8—POURING BLOWN METAL INTO OPEN-HEARTH FURNACE

The entire process may be said to last a week, for each week-end the tilting furnace is thoroughly drained, the bottom and slag line made up, the ports cleaned and repaired, and everything made ready for the week's campaign. During this interval the front and back walls are seen to, and such minor repairs made as are found necessary and there is time for. About 6 p. m. Sunday, the gas being once more on the furnace after burning out the gas flues, the work of preparing the slag is begun. Four boxes of burnt lime and three of roll scale are charged and melted down. These amounts are then repeated, and when again molten the same amounts are again charged, the total being 12 boxes of lime, and 8 to 9 boxes of roll scale. The average weight of a box of burnt lime is 2,000 pounds and of a box of roll scale 3,000 pounds. Considerable care is given by the melter to the preparation of a good slag, for the success of the process (as in all open-hearth work) depends on the slag. At midnight, or shortly afterwards, the metal is ordered from the bessemer department. An average analysis of the mixer metal is:

	Per cent.
Total carbon	3.70
Silicon	1.50
Manganese	0.65
Sulphur	0.045
Phosphorus	0.360

The weight of this metal taken for a bessemer heat is 28,200 pounds, less the weight of scrap used in the converter. Two bessemer heats, blown in different vessels, are poured into the transfer ladle and taken to the tilting furnaces. When starting up, the first ladle contains metal blown down to about 0.40 per cent carbon, to give a little action in the furnace. This first ladle is poured into the open-hearth furnace about 12:45 a. m. It is followed by two ladles of *soft* metal, that is metal blown down to 0.05 per cent to 0.07 per cent carbon, and then by a *high* ladle, or a *kicker*. This ladle contains metal blown down to 1.5 per cent to 2.0 per cent carbon, and when it is charged into the open hearth there is a vigorous reaction. The metal and slag are thoroughly mixed together, and during this reaction the phosphorus is largely removed from the metal bath to the slag. When this reaction has subsided, two more soft ladles and a high are charged. Then, if the bath is found to be low in carbon, another high ladle is given; while if high in carbon another soft ladle is charged. In this way a bath of metal of 190 to 200 tons is produced. The charge is then worked down like an ordinary basic open-hearth heat until ready for tapping, which is usually at about 3:30 a. m.

After the heat is tapped, which operation will be described a little later,

there is a bath of about 100 tons of metal with 0.15 per cent carbon still in the furnace, covered with the tapping slag. Two boxes of lime and two boxes of scale are charged, and burnt dolomite used along the slag line, around the doors, etc., as found necessary. Then three soft ladles of blown metal are charged, and two more boxes of lime, followed by the high ladle or kicker. During the reaction the furnace is tilted slightly forward and slag allowed to flow from the front of the furnace through the slag spouts. As mentioned before, these are under the doors directly on each side of the center door. The slag falls into the slag cars standing on the tracks shown in Fig. 3. Practically all the slag taken from the furnace is removed in this way, for when tapping a heat only enough is taken to properly cover the metal in the ladle. When the reaction is over, another box of lime is generally charged and the bath worked in the usual way. Very often another box of lime is spread over the slag shortly before tapping, so that five to six boxes of lime are used per heat, but as a rule only the two boxes of scale. After the heat is tapped this procedure is repeated, enough slag being taken from the front of the furnace, at the time of the reaction, to maintain a constant and proper volume of slag in the furnace. A typical analysis of this slag, together with that of the other materials, is given in Tables I and II. The average time from tapping one heat to tapping the next, for 8,073 heats, was 2 hours 53 minutes.

About 80 per cent of the steel made in the tilting furnaces as recarburized in the ladle with molten spiegel mixture. The rest is made with the usual additions of ferro-manganese, ferro-silicon, etc. When the bath is ready for tapping the tap hole is opened and plugged with wet sacking. The furnace is then tilted for pouring. Before the sacking is burnt through, the slag is up along the back wall so that clean metal comes from the furnace. As mentioned before, only enough slag is drawn off to properly cover the steel in the ladle. The 100-ton pouring ladle is held in place in the large hooks of the 165-ton crane, and when the bottom of the ladle is well covered with metal the molten spiegel mixture is also poured into the ladle. The molten spiegel comes from the spiegel cupolas along the track above the pouring platform, and the spiegel ladle is handled by the 35-ton trolley of the 165-ton pouring crane. When making rails the weight of spiegel mixture varies from 25,000 to 28,000 pounds, depending on the specification to be met, and the weight of the heat is about 100 tons, the average for 8,073 heats being 102.7 gross tons of ingots.

FIG. 9—SPIEGEL CUPOLAS AND SCALE

FIG. 10—TAPPING FURNACE AND POURING RECARBURIZER INTO LADLE

FIG. 11—POURING INGOTS

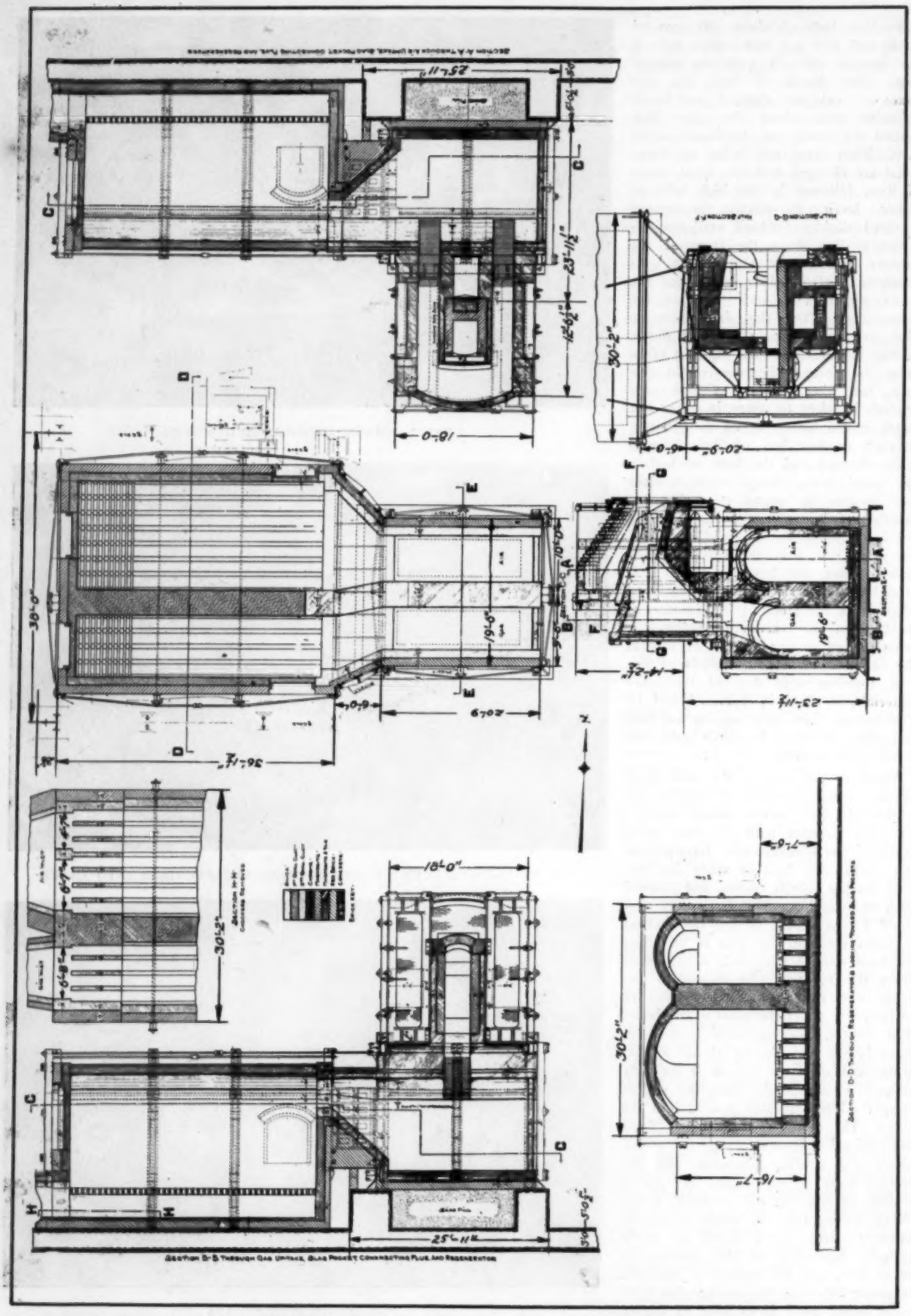


FIG. 12—GENERAL ARRANGEMENT OF SLAG POCKETS, PORTS, CONNECTING FLUES, AND CHECKERS

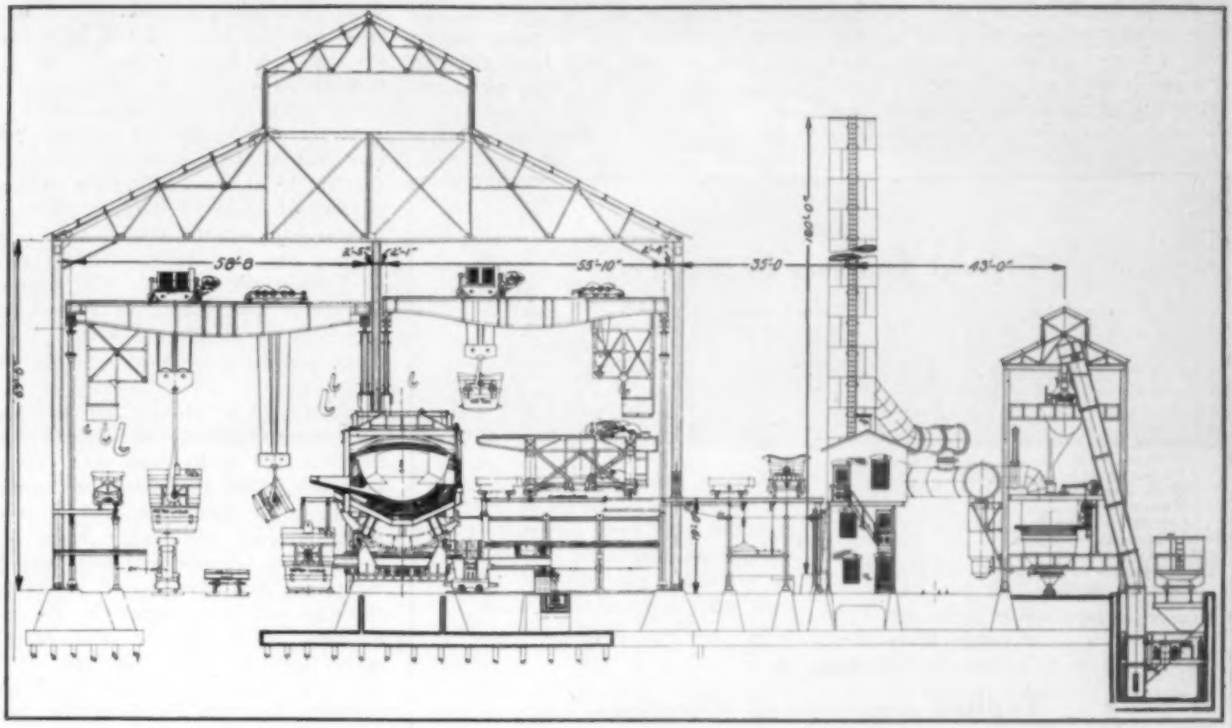


FIG. 13—SECTIONAL VIEW OF FURNACE PLANT

The operations described above may be again briefly outlined with the help of illustrations. Fig. 1 shows the operation of blowing the mixer metal in the bessemer converter, and Fig. 6, the pouring of the blown metal into the casting ladle. The hydraulic crane carrying the casting ladle is swung around, and the metal poured through a 3-inch nozzle into the transfer ladle. This is shown in Fig. 7, and is an important part of the process, for in this way practically all the bessemer slag is held back and does not enter the open-hearth furnace. Fig. 7, shows the construction of the electric transfer car. As mentioned before, this transfer ladle holds two bessemer heats. The transfer ladle, with its charge covered with coke breeze is taken to the open hearth, hoisted by the 75-ton charging crane and poured into the furnace, as shown in Fig. 8.

Two of the spiegel cupolas and the scale are shown in Fig. 9, while Fig. 10, shows the tapping of the furnace and the pouring of the recarburizer into the ladle. The pouring of the ingots is shown in Fig. 11, where the spiegel track may be seen at the extreme right.

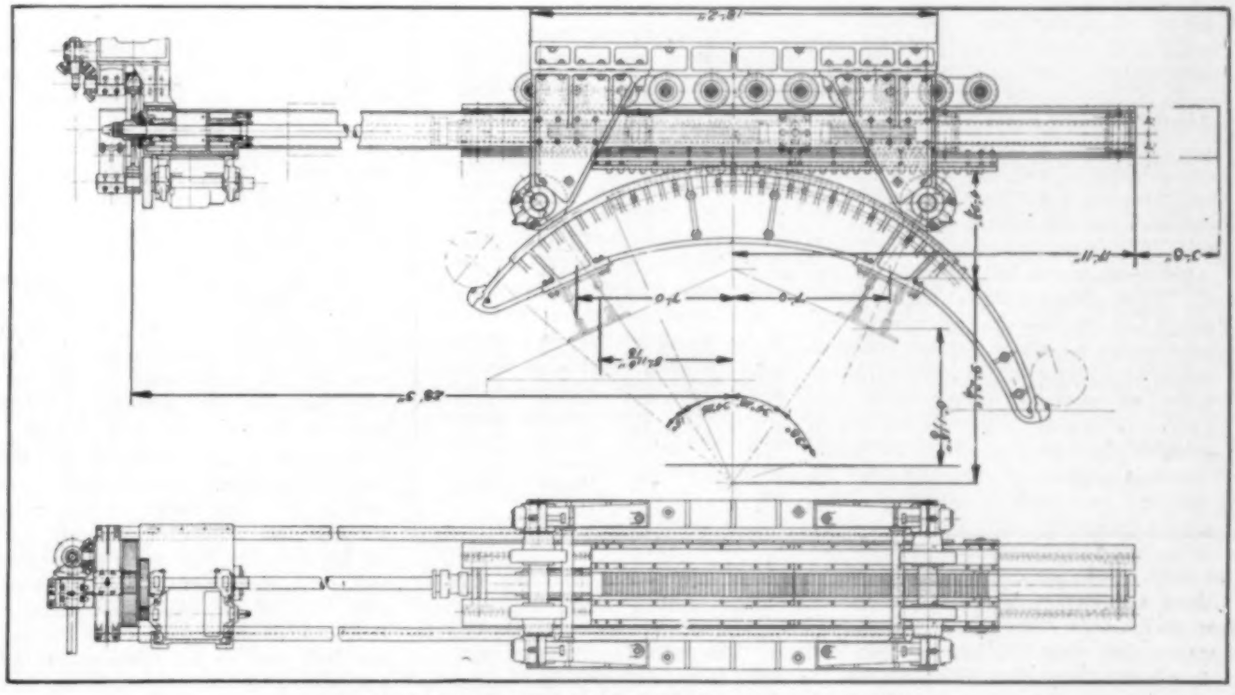


FIG. 14—GENERAL ARRANGEMENT OF TILTING MECHANISM

In Tables I and II there are given typical analyses of the materials used, together with an average slag analysis. The iron ore is occasionally used in order to get the slag into good condition, and the analysis of spiegel mixture given is one used when rails are manufactured.

About midnight on Saturday the furnace is drained. The bath is worked down so that after the heat is tapped there are not more than 40 to 60 tons in the furnace. Then, as soon as a ladle and crane can be obtained, this metal is tapped and is made into a structural or soft steel heat with the proper additions of ferro-manganese, etc.

In Table III, are given the tonnages obtained each month, and the number of turns worked since the furnaces were started to the end of August, 1916. The total for the two furnaces is 8,073 heats with a total tonnage of good ingots amounting to 830,230 gross tons. This gives an average of 102.7 gross tons per heat. It will be noticed that the best monthly tonnage for the two furnaces was the large total of 50,071 gross tons in December, 1915, and the best tonnage for a single furnace was as high as 30,272 gross tons for No. 15 in June, 1915. The average number of heats per turn for each furnace is 4.14, and the average time from tapping one heat to tapping the next is 2 hours 53 minutes. The average tonnage of good ingots per furnace for each turn is 427.6 gross tons.

In order to give an idea of the life of the furnace, a short history of each of them may be given. The first heat was tapped from No. 15 furnace May 29, 1913, and it was run until Oct. 5, 1913, being then shut down on account of business depression and repairs. Eight hundred and eighty heats had been tapped. A new roof was built, 10 courses of new brick placed in the air checkers and six courses in the gas checkers. The furnace was started again April 12, 1915. On July 16 it was shut down for a new roof and checkers after 838 heats on the roof, 1,718 heats on the checkers. Fourteen turns were lost. Nothing more than minor repairs were then necessary until January, 1916, when the furnace was down for a new roof after 1,212 heats on the old one. Fourteen turns were lost. The last repairs were made in July, 1916, consisting of a new roof and checkers after 1,303 heats on the roof, and 4,233 on the checkers. This repair took 23 turns.

No. 16 furnace was started July 22, 1913, and shut down Nov. 22, 1913, due to business depression. A new roof was built after 720 heats on the old one. It was started July 6, 1915, and ran until Sept. 19, when a new roof and checkers were put in. The heats on the old roof were 499, and 1,219 heats on the checkers. Twenty-seven turns were lost. The next shut down was March 20, 1916, when a new roof was built after 1,239 heats on the old one. Fourteen and a half turns were lost.

The standing at the end of August, 1916, for furnace No. 15 was 280 heats on the roof and checkers, 4,513 on the ports and slag pockets; and for furnace No. 16, 1,102 heats on the roof, 2,833 heats on the checkers, and 3,560 heats on the ports and slag pockets.

In regard to the quality of the steel made it has hardly been thought necessary to give long tables of heat analyses and the results of physical tests. All the steel has been made to specification, and many of the specifications have been of the most rigid character. It is not too much to say that the steel has fully met all the requirements and has proved to be very uniform from one heat to another.

Table I

Typical Analyses of Materials

	Burnt lime, per cent.	Burnt dolomite, per cent.	Burnt magnesite, per cent.	Fluor spar, per cent.	Roll scale, per cent.	Lump magnesite, per cent.	Slag, per cent.
Silica	2.10	0.45	4.10	3.44	1.75	5.15	6.50
Alumina	0.95	0.75	2.30	1.40	....	1.42	1.02
Lime	85.00	58.30	3.25	*	....	4.70	43.47
Magnesia	11.05	39.24	83.98	....	....	0.72	8.64
Ferrous oxide	.....	....	....	....	....	....	21.55
Ferric oxide	....	....	6.70	....	....	....	6.85
Total iron	....	....	....	....	70.00	61.00	21.77
Manganese	....	....	....	....	0.40	0.16	1.01
Calcium carbonate	....	....	....	6.87	....	....	....
Magnesium carbonate	....	....	....	0.53	....	....	....
Calcium fluoride	....	....	....	86.57	....	....	....
Phosphorus	....	....	....	....	0.025	1.44	3.13
Loss on ignition	1.05	....	....	....	....	....	....

*(—Fe'O')

Table II

Typical Analyses of Materials

	Molten spiegel, per cent.	Ferro manganese, per cent.	Ferro silicon, per cent.	Ferro phosphorus, per cent.
Carbon	4.30	7.00	0.15	0.17
Manganese	6.00	79.50	.....	0.15
Sulphur	0.02	.....	.....	0.65
Phosphorus	0.08	0.20	0.05	18.70
Silicon	1.25	1.00	49.50	0.39
Iron	....	12.30	49.00	77.00
Aluminum	....	.....	0.30	.....

Table III

Production Record of Two Furnaces

Year—Month.	Furnace No. 15. Turns.	Heats.	Tonnage.	Furnace No. 16. Turns.	Heats.	Tonnage.	Total Tonnage.
1913—							
May	5½	9	841	....	...	.....	841
June	49	201	18,964	....	...	.....	18,064
July	54	223	22,168	19½	69	6,863	29,031
August	54	227	22,705	50	199	19,736	42,441
September	52	199	20,069	52	197	19,647	39,716
October	5½	21	2,170	52	189	18,960	21,130
November	....	...	.....	31	102	10,030	10,030
1915—							
April	34	132	13,056	....	...	.....	13,056
May	51	244	25,418	....	...	.....	25,418
June	52½	284	30,272	....	...	.....	30,272
July	35	179	18,870	31	150	15,568	34,438
August	53	220	23,138	54	218	22,539	45,677
September	54	242	25,252	27	94	9,739	34,991
October	54½	212	22,115	50½	190	19,247	41,362
November	53½	231	24,480	53½	221	23,012	47,492
December	55½	245	25,693	55½	236	24,378	50,071
1916—							
January	40	166	17,302	54	222	22,852	40,154
February	51½	228	23,695	51½	226	23,402	47,367
March	55½	244	25,710	41	170	17,611	43,321
April	52	218	22,690	52	218	22,572	45,262
May	54½	228	23,772	54½	229	23,789	47,561
June	52½	225	23,387	52½	218	22,653	46,040
July	29½	111	11,234	52½	196	19,798	31,032
August	54½	225	22,790	54½	216	21,773	44,563
Total	1,053	4,513	466,061	888½	3,560	364,169	830,230

WHAT'S WHAT and WHY

Don't Ask Yourself-Ask Us!

Questions from our Readers answered by Experts

Extras on Bars

If a consumer of steel bars buys at $2.50 per hundred pounds, Pittsburgh, and the price is so stated in the contract, can the seller collect for extras?

In the case of a sale made in Cleveland not long ago, the buyer refused to pay any extras and was sued by the seller. The case came up for hearing recently in a court in the interior of the state and the judge decided that he would not compel the buyer to pay more than the base price. We are very doubtful whether this decision will be maintained by the higher courts, for even if there is nothing said in the contract or correspondence in regard to extras, it is understood by all who know anything about trade conditions that certain extras stated in the bar cards of all the leading companies are charged and must be paid by buyers unless definitely waived by the seller.

How is Scrap Graded?

Kindly advise what constitutes the different grades of scrap iron, or, in other words, how is it graded? Do prices vary in different sections?

Scrap is graded according to its chemical composition and size. As to chemical composition there are generally five grades: (1) carbon steel, (2) wrought iron, (3) cast gray iron, (4) malleable iron, and (5) low phosphorus steel. Composition is roughly determined by the appearance of a freshly sheared surface. Great care is taken to keep each grade to itself.

The size of pieces of scrap is limited by the charging apparatus of furnaces in which the scrap is melted. For instance, the charging boxes of steel mills will not take pieces over 6 feet long or 18 inches wide, and for convenience in handling, the weight of any piece is limited to 300 pounds. Foundries require scrap in much smaller pieces, generally less than 3 feet in length and less than 75 pounds in weight. Each mill and foundry has its own specifications for the scrap it uses and dealers and producers must adhere carefully to them. Cast iron borings are kept separate from steel machine shop turnings.

Prices of scrap vary considerably in various parts of the country, due to varying market conditions. Prices are usually determined in the consuming centers and transportation charges to those districts are instrumental in establishing prices outside.

Percentages of Carbon in Tool Steels

Kindly let me know what percentage of carbon is satisfactory in steel for general tool work. What is a point of carbon?

For tools, steel containing from 0.9 to 1 per cent of carbon is the grade most generally used. If a closer variation is desired, then for small lathe tools and drills use steel having from 1.2 to 1.7 per cent carbon. For large drills, knives, axes, and some threading dies use from 1 to 1.2 per cent carbon steel. For chisels, most screw dies and drills, milling cutters, etc., about 0.9 to 1 per cent carbon steel is used. Cold chisels and set tools that must have a hard cutting edge and be backed up by a tough and unhardened metal that will stand hammer blows, have from 0.8 to 1.0 per cent carbon. Drop hammer dies are generally made of 0.75 per cent carbon steel. For hot work hammers and the like, steel as low as 0.5 per cent carbon is used. A point of carbon is 0.01 per cent. The word temper is applied to the amount of carbon in the steel, a high temper meaning a large percentage of carbon. The use of the word should not be confounded with the act of tempering which is a heat treatment to reduce the hardness.

Proper Mixtures of Gas and Air

What is a satisfactory mixture of natural gas and air for a pit furnace in which the air is supplied at a pressure of about 14 ounces?

Natural gas varies as to quality, but as a rule, it is agreed that a mixture of 11:1, by volume, of air and natural gas respectively, represents the conditions necessary for perfect combustion. This proportion, however, is not recommended in brass foundries on account of the fact that the excessive amount of air is destructive to the life of the crucible. Satisfactory results in melting brass may be obtained by increasing the volume of natural gas about 1½ per cent above that named for perfect combustion.

Federal Nitrate Plant

I was very much interested in the article which was published in a recent issue of The Iron Trade Review about the capacity of private plants which might be diverted to supply the government with nitrates in event of war. What action has been taken by the government to establish a federal plant?

The national defense act (H. R. 12766) gives the President the power to make an investigation "to determine the best, cheapest and most available means for the production of nitrates and other products for the munitions of war and useful in the manufacture of fertilizers and other useful products by water power or any other power as in his judgment is the best and the cheapest to use" He also is authorized to expend $2,000,000 to carry out the purposes of the act. The National Academy of Sciences has appointed a committee at the request of the secretary of war to co-operate with the American Chemical Society in an effort to furnish the war department with such information as will aid the department to the greatest degree. The American Electrochem-

ical Society, through its committee on public relations has expressed the opinion that this legislation is unwise. The society advocates the storing of an 18 months' supply of Chilean nitrates at various stragetic points. It deprecates the entrance of the government into an industrial field, which in its opinion can be developed much better and more rapidly by private interests. Further than this, the society urges that the government research facilities be devoted to a study of the oxidation of ammonia and of the method of handling nitrogen-fixing bacteria. The society believes that of the natural sources of fixed nitrogen, the only one worthy of consideration is the by-product ammonia derived from the distillation of coal.

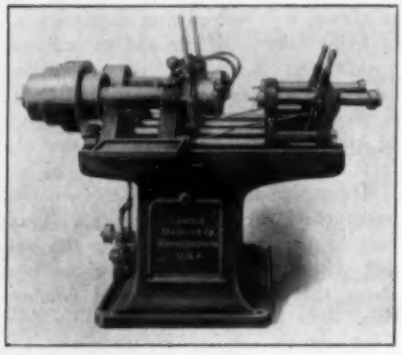
Uses of Tungsten

Will you kindly give us some information regarding the uses of tungsten, particularly in foundry practice?

Tungsten has very little application in the foundry. It is a very expensive metal and its principal use is in the manufacture of high speed tool steel. The original Taylor-White high speed steel contained 8 per cent of tungsten. Modern high speed steels contain all the way from 3.4 to 24 per cent of this metal. Tungsten adds greatly to the durability of a cutting tool and this accounts for the large proportion of it used in some tool steels. Tungsten also increases the magnetic retentivity of steel. For this reason, it is used extensively for magnet steel. Magnet steel, sometimes called Wolfram steel, usually contains from 5 to 10 per cent of tungsten and from 0.4 to 2.00 per cent of carbon. This kind of steel is used, of course, only for permanent magnets, in which work it has been found to produce very satisfactory results.

Designs Novel Threading Machine

The Landis Machine Co., Waynesboro, Pa., has recently perfected a threading machine equipped with special carriages for threading hollow safety set screws as shown in the accompanying illustration. While these machines were primarily designed to thread hollow safety set screws, they may be employed in threading stock where there is a continuous thread. The carriages are stationary and support two spindles which have a free horizontal movement. These spindles are brought to the threading die heads by means of weights which are attached by chains to the levers operating the spindles. These weights exercise a continuous force upon the spindles in the direction of the die heads making it unnecessary for the operator to advance the stock for the threading operation.



THREADING MACHINE EQUIPPED WITH SPECIAL CARRIAGES

The heads of the spindles are bored and fitted with mandrels for holding the set screws. A collar is placed on the rear of each spindle, making it adjustable for cutting any desired length of thread. For the threading operation, the set screw is placed upon the mandrel and the spindle automatically forces it into the die head. When the screw is threaded it remains in a tube which extends through the spindle from the face of the threading die head to the rear of the machine. The subsequent threading of screws forces the finished pieces through the tube where they drop into a receptacle placed at the rear of the machine.

These machines may be used for threading standard bolts by attaching automatic opening and closing attachments for the die heads. When standard bolts are threaded, the heads of the spindles on the carriages are fitted with bolt sockets for the various diameters within the range of the machine.

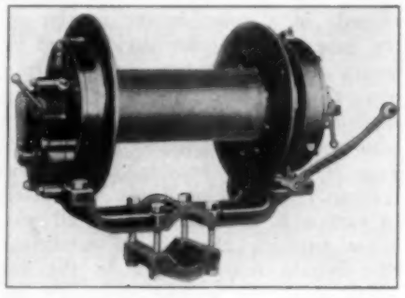
Thury Regulator at Exhibition

A feature of the Westinghouse Electric & Mfg. Co.'s exhibit at the New York Chemical exposition, which interested technical visitors at the show, was the Thury electric furnace regulator, which was invented by R. Thury of Switzerland. This is said to be the first time this device has been exhibited in America, although it has been installed on a number of furnaces. The function of this regulator is to keep the furnace current at a constant value for which the regulator is set. This is accomplished by automatically raising or lowering the furnace electrodes—depending on the variation in the current—by means of a motor-driven winch. The regulator controls the winch motor and causes it to run in the proper direction as the increase or decrease of the current demands. The motor does not revolve continuously until stopped by the regulator, but makes a succession of quick turns at short intervals, relieving any tendency for the electrodes to be pulled too far apart and thus cause unstability.

The Clarage Fan Co., Kalamazoo, Mich., has opened a branch office at 123 West Madison street, Chicago. L. O. Monroe has been placed in charge. The company manufactures fans, exhausters, blowers, engines and heaters.

New Model Portable Hoist

For those who prefer manila rope to wire rope for light hoisting and hauling, the Ingersoll-Rand Co., 11 Broadway, New York, has brought out a new model portable hoist. The square piston, reversible driving engine, automatic lubrication, enclosed gearing, drum release clutch and worm operated band brake are essentially the same as the model which was described on page 428, *Iron Trade Review*, Sept. 3, 1914. The main differences are in the diameter and length of the drum, and over-all dimensions.



NEW MODEL TUGGER HOIST

The new model has a hoisting drum 7 inches in diameter, 17 inches long with 5-inch flanges. This accommodates 300 feet of ⅞-inch manila rope. The maximum capacity of this hoist is conservatively rated at 600 pounds. The weight of the hoist itself is 358 pounds. It is 21½ inches long, 31¼ inches wide and 23 inches high.

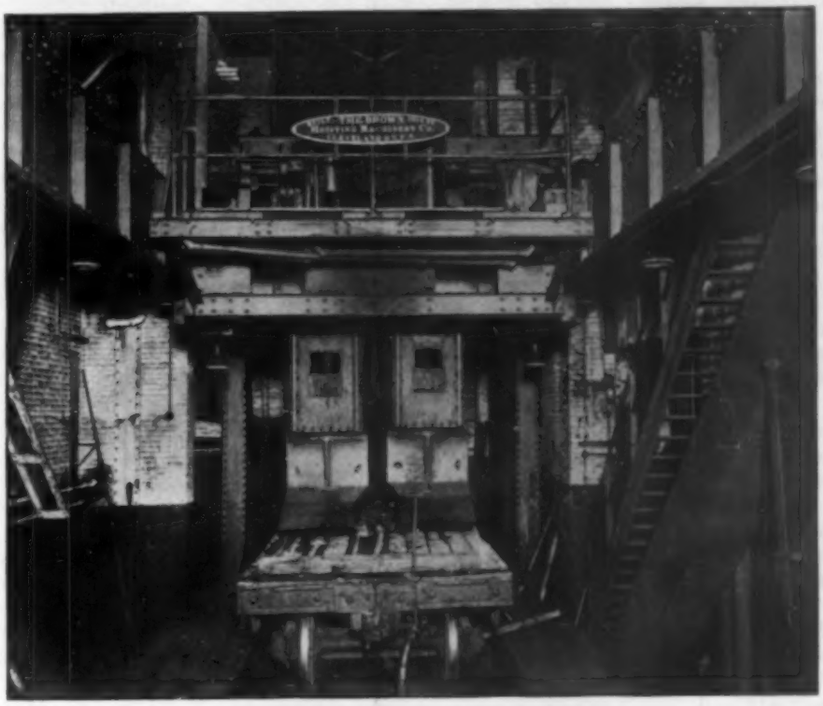
Like other models the new type is built for operation both by compressed air and steam. The standard clamp fits a 4½-inch diameter column or pipe but by removing the clamp the hoist can be readily bolted directly to any convenient support, timber, flooring, etc. Although designed primarily for underground work it is said to be suitable for hoisting, hauling and handling in mines, tunnels, quarries and industrial plants.

Builds Coal Breaker and Unloader

A COAL BREAKER and unloader designed and patented by J. P. Considine, Detroit, has been built by the Brown Hoisting Machinery Co., Cleveland. It was designed primarily for unloading cars in which the coal had frozen, but it has proved to be a very useful machine at any period of the year. It unloads a 50-ton coal car in from five to six minutes, forcing the coal into the track hopper.

The coal breaker and scraper consists of a carriage supported by and traveling longitudinally on a girder runway, and two spuds with air hammers carried by the carriage. The carriage, weighing 15 tons, is held in position by four double-flanged wheels which run on the top of the runway girders, and is driven by a 22-horsepower variable speed motor through pinions that mesh into racks fastened to the bottom of the girders. Another method for propelling the machine along the runway is by cables dead-ended at each end of the runway and connected to the traveling motors on the machine. Either of these arrangements affords a positive drive that does not depend upon the tractive efforts of the flanged wheels. The travel motor is provided with a solenoid brake for promptly arresting the high-speed parts of the mechanism when the current is shut off. A limit device is also provided for the travel mechanism, to prevent running off the runways. The carriage carries two spuds, each weighing 4½ tons and each suspended by a cable. In the spud above the anvil block there is a double acting air hammer. The two spuds occupy approximately the full width of the car, and each may be operated independently or in unison, being raised by one 52-horsepower variable speed motor. The hoist motor is provided with a solenoid brake, and there is a limit device installed to prevent accidents due to overhoisting.

In the accompanying illustration the spuds are shown lowered to a position at which the elevation of the lower ends corresponds to the height of the car floor. When the machine is not operating the spuds are carried at the highest position, the lowest extremity being on a line with the bottom of the carriage. As shown, the bottoms of the spuds are cut out at the inner side, thus allowing them to clear the center beam on hopper bottom cars. A small portion of the coal escapes through the opening between the spuds, but this is negligible in amount.



COAL BREAKER AND UNLOADER

When a car is to be unloaded it is placed over the hopper and the doors dropped. If necessary, as in the case of frozen coal, the spuds on the machine can start the coal flowing through the doors. The machine is run to one end of the car and the spuds lowered into the coal and then the machine is run forward scraping the coal towards the doors and dropping it into the hoppers.

Reinforcing Wooden Underframe Cars

Owing to the serious car shortage at the present time, it is imperative that every car, however old or dilapidated, be, if possible, pressed into service. It is exceedingly difficult to obtain new cars at the present time owing to protracted deliveries and high prices of labor and steel. Some economical and efficient method of strengthening wooden underframe cars to fit them for service in heavy trains has been earnestly sought for. Among other solutions to this problem is an application of cast steel draft arms by the American Steel Foundries, Chicago. These arms which are separate castings replace the wooden draft timbers and extend from the end of the car to a point 30 inches or more back of the body bolster. They extend along the sides and underneath the center sill so as to make a solid connection with the body bolster and are applied comparatively easily as the car floor does not have to be torn up. It is claimed that at the present time there are nearly 300,000 of these arms in service. It is believed that through the use of this device that many cars may be pressed into service that might otherwise be condemned or at least removed from use while being rebuilt.

Book Review

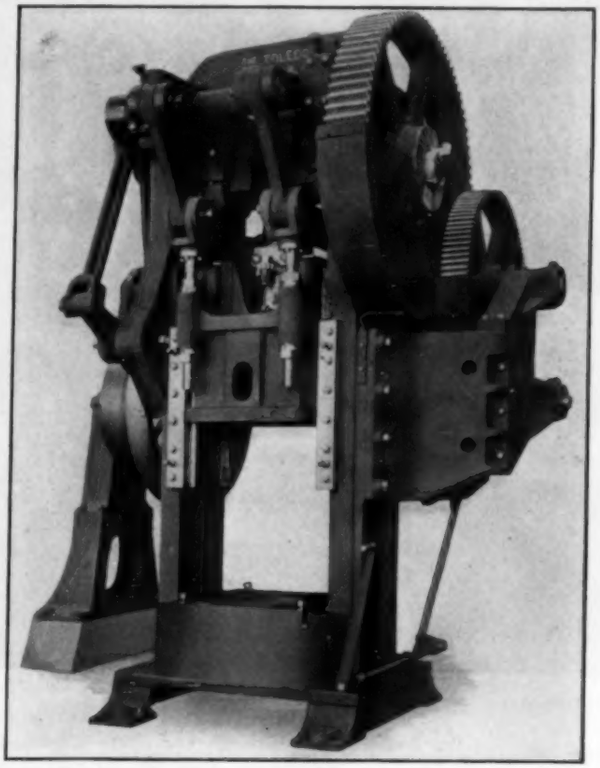
Exporting to Latin America, by Ernst B. Filsinger; cloth, 565 pages, 6 x 8½ inches; published by D. Appleton & Co., and furnished by *The Iron Trade Review* for $3.00 net.

Although the South American countries by virtue of their position would seem to offer greater opportunities to the manufacturers of this country than to those of any other, this has not proved true in the past. Only since the European war has presented an almost insuperable barrier to commercial intercourse between Europe and these states has the United States made any great steps toward carrying on an extensive trade there. In this book the author

points out what a very fertile field lies before us if we will only make the effort to develop it. He describes the conditions in the various countries and shows how these affect commerce, and, as they do affect commerce, why the American manufacturer should study them. Much valuable information on subjects with which the manufacturer contemplating opening business relations in any of these countries should be acquainted is contained in the book. A few of the important subjects discussed are tariffs, custom house regulations, the preparation of suitable advertising matter, shipping routes, European and American methods of the export commission house, the employment of general and local agents, etc. In fact the material contained in the volume forms a very complete study of economics, social and commercial conditions in the Latin American states and should be of value to every American exporter.

Perfects Toggle Drawing Press

THE Toledo toggle drawing and presses built by the Toledo Machine & Tool Co., Toledo, O., are used for drawing stamped steel and enameled ware, seamless steel bathtubs and sinks, automobile radiator casings and similar parts. These presses are built in a number of sizes for work varying in size from tin cups and lantern parts to seamless stamped or steel drawn automobile bodies, road scrapers and similar work. The weight of these presses ranges from 6,700 pounds to 650,000 pounds. The press frames, slides, gibs, connections, adjustments and shafts are said to be of liberal proportions and special care has been given to their design. One of the claims made by the manufacturer of these presses is that the blank-holder control mechanism is so designed that it not only insures a perfect dwell of the blank-holder during the entire drawing operation, but that it exerts all of the necessary power required, and wasters, due to undulating or yielding of the blank-holder pressure, are eliminated. The timing in relation to the other moving parts of the press is said to permit effective balancing of the entire machine, so that smooth running is assured. It requires but little effort either to start or stop the press at any part of the stroke. The blank-holder pressure is transferred direct to the frame of the press through the straightened toggles. On the larger presses a power slide elevating and lowering attachment operated either by a belt or individual electric motor is furnished.



LARGE TOGGLE DRAWING AND DEEP STAMPING PRESS

The Toledo friction clutch, in conjunction with a brake, is fitted to all the presses. It is said to be simple in design, and powerful, with large friction and breaking surfaces. A quick, accurate adjustment is provided in such a manner that damage to, or failure of, the clutch by unequal adjustment is avoided. In addition to the hand lever, an automatic releasing mechanism is fitted to the clutches on all the smaller and medium size machines. This automatic release is operated by a foot lever, the depression of which causes the crank shaft to make one revolution and stop at the top center. It is quickly and easily disengaged thus keeping the machine completely under control of the operator. This device is said to afford great convenience in setting dies and providing for the continuous running of the press.

The method of supporting the gearing in the smaller and medium size presses, by means of a specially designed bracket bolted to the frame, affords compactness and rigidity and does away with the outboard bearings allowing a free space all round the machine for ready access and for the handling of material. In the larger presses the first driving shaft with the flywheel is mounted on a heavy sub-base. The intermediate shaft is supported by a bracket the same as the first drive in the smaller sizes. The acompanying illustration shows one of these large drawing presses which is being used for the manufacture of enameled ware.

The wide demand for abstracts of current decisions on mining has led the bureau of mines to issue bulletins on this subject with sufficient frequency to keep the public posted on decisions rendered by the federal and state courts. Law Serial No. 8, which has just appeared, deals with minerals and mining land, mining corporations, mining claims, statutes relating to mining operations, leases and properties, damages for injuries to miners quarry operations and interstate commerce.

The latest report on lead issued by the United States geological survey states the output of lead from domestic ores in 1915 was 507,026 short tons, valued at $47,660,000 at the average price of refined lead in New York, as compared with 512,794 tons valued at $39,998,000 at the average price in New York in 1914, a loss in quantity of 5,768 tons, about 1 per cent, and an increase in value of $7,662,000, nearly 20 per cent.

"That and This", and a little of the other thing, have been assembled into a 56-page booklet issued by Frederic B. Stevens, Detroit. The author is frank in stating that it is not a summer idyl, and it is a sequel to "This and That", another booklet from Mr. Stevens' pen issued some months ago. As a piece of trade literature, this work is unique, every page bearing the stamp of the Stevens individuality. Frederic B. Stevens manufactures foundry facings, foundry supplies, buffing compositions and electro-plater supplies.

The Iron Ores of the Adirondacks

Few People Realize the Extent of The Iron Ore Deposits in This Region—The Ores, Unusually Rich, Are Concentrated by Improved Methods—Opening an Outlet Through the Champlain Canal

BY FRANK S. WITHERBEE

MAJOR PHILIP SKENE, of Skenesborough, now known as Whitehall, N. Y., was probably the first man who mined iron ore in the Adirondack iron ore district. He received from the English Crown before the Revolutionary war, a grant of about 600 acres, located just north of Port Henry, on Lake Champlain, known as the Skene ore-bed tract. He built a small Catalan forge at Skenesborough, and a fairly well authenticated tradition exists that ore was mined from this tract and shipped to Skenesborough, where anchors, chains, spikes and other needed appurtenances were made to fit out Benedict Arnold's fleet.

No other development in this district is known to have taken place until about 1800, when the Cheever mine, located in the Skene tract, and the Arnold Hill mine in Clinton county, were worked in a primitive way to supply a few Catalan forges in the vicinity. But it was not until the completion of the Champlain canal, which connected Lake Champlain with the Hudson river at Troy, that the real development of the district commenced. With this outlet established, many new Catalan forges were built, and the first charcoal blast furnace was completed at Fort Henry about 1822. This furnace was supposed to be the best thus far built. It produced about 25 tons of pig iron weekly.

Iron ore was shipped to outside furnaces, and it is an interesting historical fact that Lake Champlain ores were introduced into the Pittsburgh district before Lake Superior ores were delivered there. Pittsburgh also became the largest market for the charcoal billets and blooms made in the district. From 1860 to 1870, the iron industry of the district was at its height, but soon after this period the new bessemer and open hearth processes of producing steel commenced to displace the crude and wasteful method of the Catalan forge, and the little charcoal blast furnaces gave way to the larger stacks which used first anthracite coal and finally coke. The small and lean deposits of ore could not compete with the newly discovered and cheaper mined Gogebic and Mesabi ores of Lake Superior, but the larger deposits and more cheaply mined ores have survived this competition, and there is more ore mined in the district today than ever before.

FIG. 1—VIEW OF HEAD FRAME, LYON MOUNTAIN

To the credit of the Adirondack district, it can be said that it has always been progressive, as is shown by the fact that the use of electric lights underground, and the substitution of dynamite for black powder, were first introduced there and probably nowhere in the country today has electrical power for mining been used more generally than in the completely equipped plants of the Port Henry district. The ores are undoubtedly the richest and the highest grade shipped from any district, being guaranteed from 60 per cent iron in the crude to 65 per cent in the concentrates, and in one special grade a guarantee is given of 71 per cent. Throughout this paper the iron content given refers to the ore in its natural state, not dried at 212 degrees Fahr. As a rule, magnetites carry less than ½ per cent of moisture. The phosphorus content of the different ores runs from 0.005 to 1.50 per cent, although probably 60 per cent of the known deposits are easily within the bessemer limit. It is a very interesting fact that in

The author of this paper, which was presented at the St. Louis meeting of the American Iron and Steel Institute, is president of Witherbee Sherman & Co., Port Henry, N. Y.

FIG. 2—OUTCROP UNCOVERED IN CLINTON COUNTY

FIG. 3—BLUE VEIN, ARNOLD HILL, CLINTON COUNTY COUNTY

the Barton hill mine of Witherbee, Sherman & Co. there was at one time an enrichment of a vein, from which over 60,000 tons of crude ore were mined, with only three analyses running below 70 per cent in iron. This is probably the richest shipment ever made from any deposit in this country.

In the Adirondack region today two blast furnace plants are operating, one at Standish, where an exceedingly low phosphorus special bessemer iron is made from Chateaugay ores, and another at Port Henry, where all grades of iron are produced, including special bessemer, forge, foundry and basic. The special bessemer irons frequently carry phosphorus as low as 0.02 per cent, and are regularly sold on a guaranty of not to exceed 0.03 per cent phosphorus and sulphur. Local magnetic ores are used exclusively in both furnaces, and the fuel records from the rich all-magnetic ore mixture compare most favorably with the best practice of the central west. The Adirondack region is not the ideal one, however, for the manufacture of iron owing to the very high freights on fuel and the distance from active pig iron markets.

For the geological data and estimates of ore reserves contained in this paper I am largely indebted to Frank L. Nason, geologist and mining engineer, whose former association with the geological surveys of the states of New York and New Jersey, together with frequent and extended examinations of the region, have afforded him ample opportunity for observation and study, and he is undoubtedly the highest authority on the magnetic iron ore deposits of the east.

Extent of Deposits

The Adirondack iron ore field covers the entire Adirondack mountain system. It lies in the northeastern part of New York in the angle formed by the St. Lawrence river on the north and by Lake Champlain on the east. Its entire area is about 10,000 square miles. Roughly outlined as a square, the distance from north to south is 100 miles, from Malone to Old Forge, and from east to west about the same distance, from Port Henry to west of Benson mines. Large areas of this square are covered with barren palezoic rocks. The core of the mountain is almost wholly gabbro and norite. The productive area on the Lake Champlain side can be approximately divided into two districts, the Clinton county with a northwest diagonal from the Cook mine to Lyon mountain, a distance of about 30 miles, with a breadth of about 10 miles from Black brook to the Beattie mines. This area thus covers about 300 square miles. The Clinton county belt is divided from the Essex county belt by a broad, irregular tongue of gabbro, which reaches east from the central gabbro core of the Adirondacks to Lake Champlain along the Bouquet river. The north and south axis of the Essex county belt extends from north of Port Henry to south of Crown Point —about 20 miles. The east and west axis, from Port Henry to west of Mineville is not less than 10 miles. The parallelogram covers thus about 200 square miles.

The gneisses and white limestones extend from Hammondville as far south as Whitehall and then west to near Old Forge. With the exception of a few mines from which a few thousand tons of shipping ore have been taken, this field so far as is now known is barren.

Production of Magnetite is Expensive

Thirty-six years ago, when magnetite ore was about 35 per cent of the total iron ore production of the United States, the Cheever Iron Ore Co., at Port Henry; Witherbee, Sherman & Co. and the Port Henry Iron Ore Co., at Mineville, Palmer hill and Lyon mountain, in Clinton county, produced about 66 per cent of the magnetite. The remaining 34 per cent came mainly from Pennsylvania, New Jersey and southeast New York. Today the production of magnetic iron ore comes mainly from the Adirondack region. Two mining districts, Mineville, including the Cheever, at Port Henry, and Lyon mountain, produce at the rate of 1,250,000 to 1,500,000 tons of shipping ore yearly. The crude ore carries about 60 per cent iron and the concentrates about 63 to 68 per cent. With comparatively small additional developments, this production might be nearly doubled.

The total iron ore production of the United States in 1916 will approximate 80,000,000 tons, with an average of about 50 per cent iron. It is well within the range of possibility that the Adirondack field can produce over 6 per cent of this tonnage, and because of the richness of its ores, about 8 per cent of the total iron. Moreover, with iron ore reserves conservatively estimated at 1,100,000,000 tons, concentrating on an average of 2 into 1 of higher than 63 per cent iron, the Adirondack field promises, on present showing as above, when developed, to produce 5,000,000 tons of concentrates annually for over 100 years.

The above may seem to be a daring statement to one only somewhat familiar with iron ore production in the east. It may cause a complete surprise to many whose interests have been mainly centered in the Lake, Minnesota or Birmingham fields.

There are three species of iron ores in the Adirondack field. Straight magnetite, Fe_3O_4; titaniferous magnetite, a mechanical mixture of ilmenite and magnetite, in which titanium varies from 1 to 3 per cent up to straight ilmenite; and martite, Fe_2O_3. As a rule, these are almost absolutely pure, except the mechanical mixture of rock and rock minerals which dilute the ores as mined. Special concentrates are now being prepared by Witherbee, Sherman & Co., running upwards of 70 per cent iron. It is thus practically demonstrated that the straight magnetites of the Adirondack field lack not more than 0.3 per cent of being chemically pure iron oxides.

The most extensive workings of straight magnetites in the Adirondacks are at Mineville, near Port Henry on Lake Champlain, where Witherbee, Sherman & Co. have very extensive and modern mining plants and the largest magnetic concentrating operation in the world. The Port Henry Iron Ore Co. also operates the "21 mine" at Mineville. The other active producers of straight magnetites are the Chauteaugay Ore & Iron Co., at Lyon mountain, the Cheever Iron Ore Co., at Port Henry, and the Benson Iron Mining Co., at Benson mines. At all of these mines magnetic concentration is employed.

Concentration Process is Simple

The separation or concentration of magnetic iron ore is a comparatively simple process. It consists in breaking apart the grains of iron, quartz, apatite, etc., by means of crushers and rolls; after screening and sizing, the crushed material is treated by machines equipped with electromagnets, which pick up or deflect the magnetic particles making so-called heads and tails. The heads are the concentrates and the tails the waste product. This so-called waste product, however, frequently has considerable value. For example, the tailings of the "old bed 21" ores at Mineville carry so large a quantity of phosphorus that they are used extensively as fertilizers, and the tailings from all grades of ore make a most excellent concrete.

The complete analyses of the titaniferous magnetite ores vary in iron content from normal with 36.8 per cent iron and 31.6 per cent titanium to 55 to 68 per cent iron and 1 to 5 per cent titanium. As distinguished from the straight magnetites, they invariably contain vanadium up to 0.65 per cent V_2O_5. In addition, they

carry variable amounts of nickel, chromium, manganese, magnesia phosphorus and lime. They occur almost exclusively in the coarsely crystalline eruptive rock known as gabbro. They sometimes occur in an allied rock known as norite. In the Adirondack field there are many occurrences of titaniferous ores, but usually in small bunches or pockets. The one remarkable exception is the Sanford lake deposit. Trenches, test pits and diamond drill holes have furnished data for safe tonnage estimates. The lowest estimate for this deposit is 70,000,000 tons; the highest, 100,000,000 tons. Even with the work done, neither the lateral extent nor the depth of the deposit has been determined.

The ores have been proved to be amenable to beneficiation by magnetic separators. The ores vary from fine to very coarse grained, yet some of the fine-grained ores separate magnetically as easily as the coarse grained. Some of these ores, however, are entirely unamenable to magnetic separation. This is due to interlamellar growth, alternating layers of ilmenite and magnetite. So intricate is this growth, occasionally even fine grinding fails to break apart the ilmenite and the magnetite. Several experiments, however, showed that coarsely crystallized titaniferous ores crushed to 40 mesh and treated with a hand magnet yielded heads that carried 64 per cent iron, 3 per cent titanium and 1 per cent metallic vanadium. The vanadium of the crude ore went entirely with the magnetite. Typical analyses follow:

	Per cent, Sanford crude.	Per cent, Sanford concentrates.
Fe.	50.52	58.39
Ti.	11.71	6.19
P.	0.009	.....

Martite

As the third class of iron ore, martite is of a very limited occurrence and is found associated exclusively with the straight magnetites, it may be as well to mention it here. Martite, as is well known, is an ore with the crystallization of magnetite and the hematite formula. It is supposed to be a secondary mineral derived from the oxidation of Fe_3O_4 to Fe_2O_3. In the mines around Mineville it is found in a limited crushed fault zone in the Joker-Bonanza and the underlying Old Bed. So far as is known, it is not found in the main body of any one of the deposits in Essex county. In Clinton county it is nearly 33 per cent of the iron content of one large ore body. When the ore body in which martite is found is of shipping grade as mined, it is rather beneficial than detrimental. In a milling ore, however, the case is quite different, since martite is non-magnetic. When, therefore, martite is a considerable portion of the total iron in milling ores, other concentration processes must be used in connection with the magnetic, otherwise heavy losses in the tailings will be unavoidable. The known occurrences of martite are, however, very rare.

How to Distinguish the Typical Ores

The rocks which contain the straight magnetites need never be mistaken for the gabbros and norites which carry the titaniferous ores. There is, however, absolutely no need for the practical man to undertake to make the distinction. If iron ore is found, the presence or absence of titanium in amounts exceeding 2 per cent will settle the question of the class of rock which contains it. If the ore is titaniferous, it is a pocket and the expense of development is usually thrown away. If it is non-titaniferous, if the outcrop is promising, the risk of development is a legitimate one. Of course, the above is a rule of thumb, perfectly safe for the tyro, but is subject to exception.

For the technical man, however, there is need of ability to make distinctions. These are the main field distinctions: Without exception the iron-bearing gneisses are foliated and bedded; the gabbros, never, unless sheared. The immediate iron-bearing gneiss, known as "Mt. Hope", "Gray", or locally as "21", is gray in color, uniform in texture; its component minerals are quartz, feldspar, biotite hornblende and grains and crystals of magnetite. The presence of magnetite is distinctive. They weather uniformly. The Benson ore deposit is a straight magnetite. Though occurring in the white limestone series the wall rocks are gneisses. These differ from the gray gneiss, but the foliation is identical and the Benson ore beds conform to this foliation.

In view of the fact that the iron ore reserves of the Adirondack district have been estimated at 1,100,000,000 tons, it may be well to cite a few facts on which this estimate is based. On geological maps of the district 37 separate localities of ore deposits are given. If these represented only 37 mines or bodies, the average tonnage for each would have to be 30,000,000 tons. This average has been equaled by one mine, the Joker-Bonanza, and "21" at Mineville. In addition, there is another ore body underlying this which has a proved area of over 5,000 feet N.W.-S.E. and a width of over 2,000 feet, with the extreme eastern and southern limits yet to be fixed. Still another proved area at Mineville has a continuous outcrop 4,500 feet, and two drill holes respectively 3,000 feet and 4,000 feet on a line at right angles to the strike.

In Clinton county, N. Y., an almost continuous outcrop of 9,000 feet is to be seen. Along the Saranac river, magnetic attraction shows heavily for 13 miles east and west. The attraction is proved in places by test pits. One old mine shows over 40 feet thick. At Lyon mountain the outcrop of ore can be traced four miles. The thickness varies from 3 to 125 feet. The deposit is reported to have been tested ahead of the outcrop a distance of 3,300 feet.

North of Ausable Forks an ore outcrop shows 85 feet thick. A drill hole ½ mile south shows ore 75 feet thick. Two and one-half miles west, lean ore outcrops over a distance of 3,500 feet north and south. An old opening 3,500 feet still west shows 10 feet at least of 45 per cent ore.

Taking this 3½ miles as a south base line, 10 miles northwest is the Saranac river outcrop and 20 miles northwest is the Lyon mountain line.

Taking an average width of this belt at 10 miles and its northwest axis at 20, the belt contains 200 square miles. It may be 300. With an average thickness of 20 feet there are 56,000,000 tons of ore in a square mile. Ten per cent of the above area will thus account for the total estimated reserve of 1,100,000 tons. Adding the Mineville district of 200 square miles, where the ore showing is equal to that in Clinton county, if not better, the proved tonnage of 70,000,000 to 100,000,000 tons of titaniferous iron ore, the Benson, estimated at 300,000,000 tons we have a total of over 2,500,000,000 tons, making the original estimate appear conservative.

Other Deposits Below Limestone

Another possible factor here demands consideration. It has been proved by drill holes that the whole of the Mineville iron-bearing gneiss is underlaid by the white limestone formation. The maximum known thickness of the Mineville iron-bearing gneiss is 2,500 feet and in 1,900 feet thickness have three certainly, and possibly four, superimposed beds of iron ore. These are the Barton Hill, the Harmony and the Joker-Bonanza and, 100 feet below, the Old Bed. About 600 feet below the Old Bed the white limestone series has been proved by four drill holes covering an area 5,000 feet north and south and about 6,000 feet east and west.

On the west side of the Adirondack field is the Benson mine. Northeast

of the Benson is the Clifton. These two mines are in or below the white limestone. With four great mines lying in or below the white limestone series, it seems well within reason to expect that sometime in the future, to the known horizon of ore-bearing gneisses will be added another horizon in the white limestone series which underlies the Mineville district.

This is, however, prospective, and has not been considered in the writer's tonnage estimates. In estimating probable tonnage, nothing has been considered as an ore with a content of less than 30 per cent iron. It may be questioned whether 20 feet thickness is not too high. The Old Bed at Mineville so far averages 12 feet of 59 per cent iron. Distributing this through 20 feet instead of 12 feet, the iron content would be 35 per cent.

In the vicinity of Antwerp, New York, many thousands of tons of red hematite have been mined and shipped in the past. The district is nonproductive at present. There are many outcrops, but few have become developed. No account has been made of this class of ore.

Whatever may be thought of the estimated tonnage, this is a fact: The class of iron ores in the Adirondack field is the only one where, by purely mechanical operations, the ore can be brought to 70 to 72 per cent of purity, with pure iron 100 per cent. This fact alone is one worth considering: that in the best blast furnace practice from 75 to 85 per cent of the consumed fuel is used for maintaining the reduction temperature alone, leaving 15 per cent to 25 per cent of the fuel for reduction. It is within the range of possibilities that with an oxide of iron, free from all impurities, some direct process may be discovered which will eliminate the blast furnace and convert these practically pure concentrates directly into a semi-finished steel product. If, however, no further economic use can be made of the purity of these ores, this is worth consideration. In a 70 per cent concentrate there is only 30 per cent of the inert units on which freight must be paid, as against 50 per cent on a 50 per cent ore, or 45 per cent on a 55 per cent ore. Even with present mill practice at Mineville and Lyon mountain, no trouble is experienced in bringing concentrates to a 62 to 68 per cent grade.

The question may be asked how we are able to assert at the present time that the Adirondack region is capable of producing such an enormous tonnage of iron ore in comparison with what was thought to be its maximum tonnage a few years ago. The improvements in modern mining methods and machinery, together with modern crushing and preparing machinery and magnetic separation, have made it possible to utilize ores that are low in iron but mined at a moderate cost which a few years ago had no market value whatever.

The Markets For These Ores

Brief reference may be made in conclusion to the markets, past, present and prospective, for the ores under discussion. As has been said, prior to the discovery and development of the Lake Superior iron ore ranges, the ores from the Adirondack and Lake Champlain district were largely used in Pittsburgh and vicinity, but were gradually driven back into their more legitimate district east of the Alleghenies, where for several generations they have formed the basis of the mixture in blast furnaces. The selected lump ore from the Port Henry mines has also been used for very many years as a fix in puddling; and later, with the development of the basic open-hearth furnace, this ore has come into almost universal use east of the Alleghenies as an oxidizing agent.

The Dominion of Canada offers a market by no means negligible for the ores mined near Lake Champlain, and steel plants in the dominion have for many years been large buyers. In passing, it may be of interest to note the fact that in 1895 about 40,000 tons of high phosphorus Port Henry ore were exported to Germany and England, making, it is believed, the only over-seas shipment of United States ores on record.

From the Adirondack mines (including Mineville) to the trunk line railroads or to Lake Champlain, there should be added to the following figures from one-third to one-half cent per unit to cover cost of terminals or mine railroads.

The freight rates from the Adirondack region to points of consumption in the east compare most favorably with the rates paid on Lake Superior ores to points of consumption. Using Port Henry, the largest shipping point in the region, as a basis, an analysis of freight cost shows the following:

The all-rail rates to the principal consuming points are grouped into districts and range from $1.30 to $2 per gross ton, while a uniform rate of $1.45 per gross tons prevails to the east from Lake Erie ports. For the purposes of comparison the following table giving the freight costs per unit of metallic iron will be interesting. I have used 63 per cent iron for Adirondack ores and 51.50 per cent for Lake Superior ores, and have assumed $1.05 as a total freight rate from Lake Superior mines to lower lake ports:

COST PER UNIT.

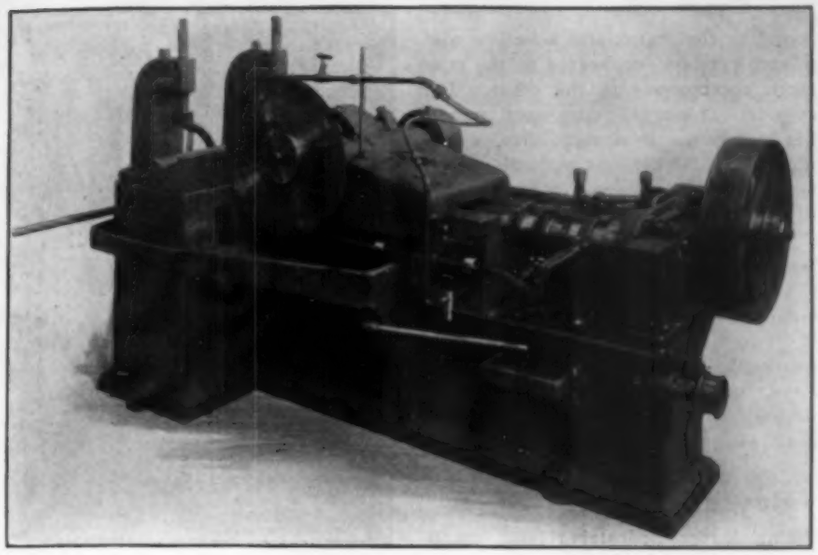
	From Port Henry.	From Lake Superior.
To Lehigh Valley.....	$0.0254	$0.0485
To Schuylkill Valley.....	0.0262-0270	0.0485
To Central Pennsylvania.	0.0292	0.0485
To Pittsburgh	0.0317	0.0372
To Mahoning-Shenango Valleys	0.0317	0.0320
To Buffalo	0.0206	0.0203

In the spring of 1917 the enlargement of the Champlain canal will be completed. This is a part of the barge canal system of the state of New York and will provide a waterway between Lake Champlain and the Hudson river with a channel 12 feet deep and a minimum bottom width of 75 feet. To overcome comparatively slight elevations there are 11 locks of the following dimensions: Usable length 311 feet, width 45 feet, 12 feet over mitre sills.

Less than 20 miles of this waterway is through a landcut. The balance of the total distance of 61½ miles, from Whitehall at the southern end of Lake Champlain to Waterford, is by means of the canalized Hudson river. This waterway will offer a means of transportation from Lake Champlain to New York harbor, thence by rail to furnace plants, which will result in lowering the above rates very materially and will still further increase the differential in favor of the Adirondack ores.

From the above freight analysis it will be observed that the Adirondack district commands a most favorable location with regard to a market for its ores, particularly for eastern plants. With furnaces located on the Hudson river, New York harbor or elsewhere on the Atlantic seaboard, the freight on an ore supply would be remarkably low. From mines tributary to Lake Champlain it is safe to say, from trial shipments actually made on the partially completed canal, that the total freight from mine to alongside New York harbor will be approximately 1 cent per unit metallic iron.

While many millions of tons of concentrated ores have been shipped from Lake Champlain mines, and many more millions of tons of high grade crude shipping ore have been moved from this district, it is frequently said that the surface has hardly been scratched. And many competent authorities believe that the future will, more and more, look toward this region as one of its greatest sources of raw material for the rapidly increasing needs of the iron manufacturers of this country.



SMALL SIZE COLD METAL SAWING MACHINE

Small Size Cold Metal Sawing Machine

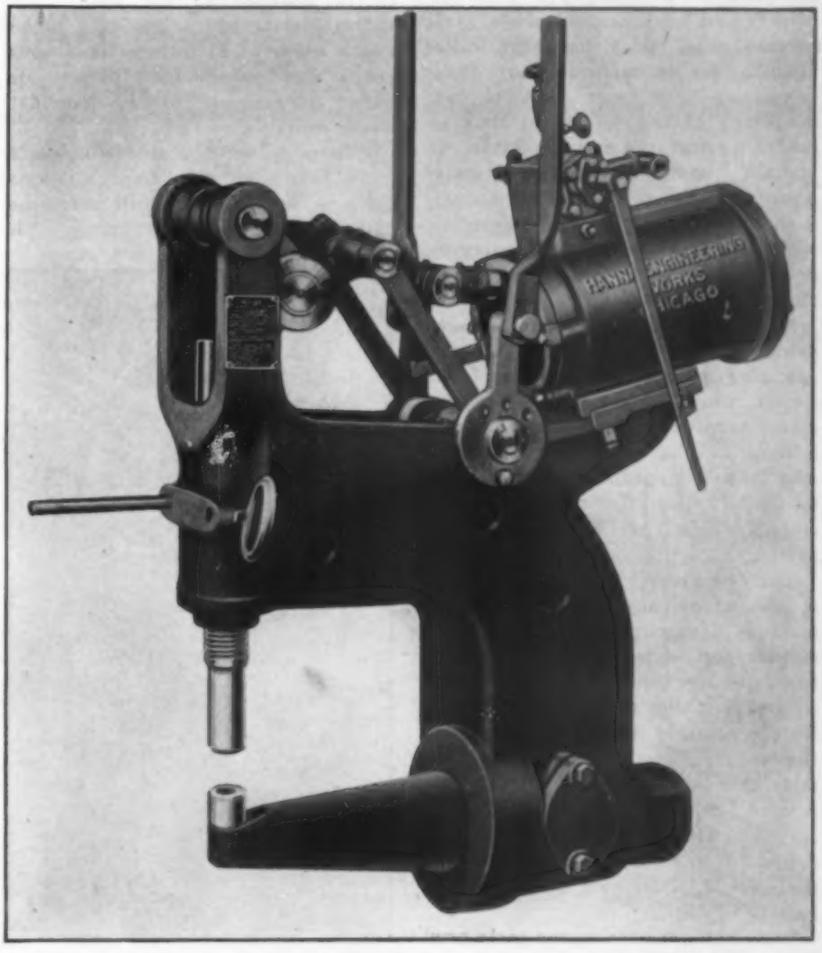
The accompanying illustration shows a small size cold metal sawing machine, which has been recently brought out by the Newton Machine Tool Works, Philadelphia. This tool is designed to handle solids in individual sizes up to 5½ inches in diameter and smaller stock that may be grouped into an equivalent section. The machine ordinarily carries a 20-inch diameter blade, and should be of either the solid or inserted high speed type. It is said that unusual precautions have been taken to prevent chatter which is so detrimental to blades, and which is the cause of many machines failing to give the production that is expected of them.

This machine is of the spindle-driven type in which the spindle revolves in capped bearings and is driven by pitch spur gears through worm and worm wheel, the worm wheel being of solid bronze. The worm is fitted with roller thrust bearings.

An essential feature is the front bearing for the feed screw which insures its operating tension. The saddle has underlocking gibs cast solid with vertical and horizontal adjustments made by taper shoes. Fast power return for the saddle is provided in addition to a gear box giving changes without removal of gears. The saddle is fitted with trips to stop the feed at any predetermined point and safety stops are provided for each of the extreme positions of travel. Pump, piping and attachments are supplied to deliver the cutting lubricant to the point of contact. The machine embodies the unusual feature of having a gear feed and has been successfully demonstrated to cut off 6-inch, 0.50 carbon stock in three minutes or at a feed of 2 inches per minute. This machine should meet with approval where high production is sought.

New Riveting Machine

The Vulcan Engineering Sales Co., Chicago, has developed an improved riveting machine designed to operate in places where the space is limited. The machine is made by the Hanna Engineering Works, Chicago, and is said to be particularly suitable for use on automobile assembly. The toggles, levers and guide links are combined to give a large opening of the toggle-joint movement with a gradual increase of pressure applied until the correct amount is secured. The toggle action takes place in the period of the first half of travel of the piston. The die travels through a large portion of its motion during the same time. The piston travel is designed to eliminate any uncertainty regarding the amount of pressure applied to the rivet. The relatively large distance through which the rated maximum pressure may be exerted makes little adjustment necessary to compensate for variations in the rivet or plate after the machine has once been set. A general idea of the construction of this machine may be had by referring to the accompanying illustration which shows the riveter in



RIVETING MACHINE WHICH EMBODIES A NUMBER OF UNUSUAL FEATURES

REVERSE PHASE RELAY

a position ready to use. The main lever, toggles and similar parts are made of steel and the main frame is cast iron. The lower toggle, die holder and piston rod are steel.

New Reverse Phase Relay

In the constantly increasing efforts of large power companies to afford all possible protection to life, machinery and manufactured product, the reverse phase relay has been called upon to play an important part. These companies have been quick to take advantage of the protection thus afforded against the serious results attendant upon alternating current power motor reversals, particularly if these motors are used in connection with elevators, hoists, conveyors, cranes, machine tools and textile machinery.

Among the common causes of accidental phase reversal are the interchanging of wires by power companies when repairs to cables are made, involving a temporary discontinuing of the service mains. This may also happen when additional switching apparatus is installed or when additional service wires are connected.

The new reverse phase relay, shown in the accompanying illustration, is made in both circuit-opening and circuit-closing styles. Both types of contacts are equipped with toggles so arranged that there is no tendency for the contacts to open or close until the toggle has buckled. The contacts then are thrown quickly to the desired position by means of a small spring. The type of contacts required for any installation depends on the method of tripping out the motor switch.

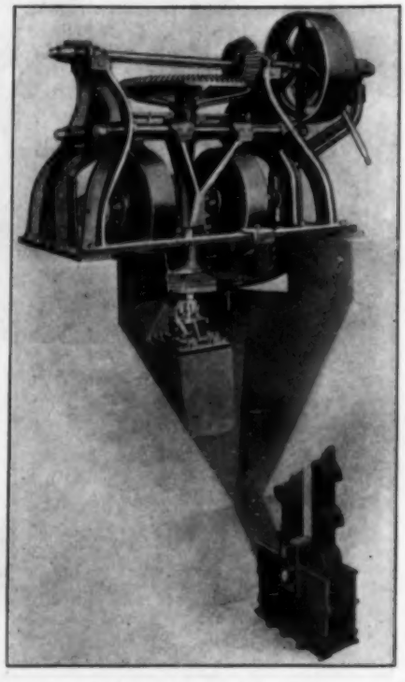
The relay operates on the same principle as a squirrel-cage induction motor. The operating coils correspond to the stator and a hollow aluminum cylinder, connected to the contacts, corresponds to the rotor. The cylinder (plunger) does not rotate, but moves in a straight line, either up or down, depending upon the phase rotation. When one of the phases of the line is reversed, the plunger moves and operates the circuit-opening or circuit-closing contacts.

These relays, which are made by the General Electric Co., Schenectady, N. Y., can be constructed for two-phase or three-phase service with either current or potential windings, depending upon the amount of current and the voltage of the circuit.

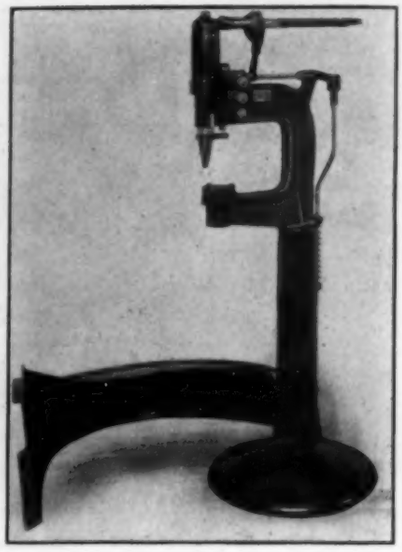
Boyer Pedestal Riveter

The Boyer pedestal riveter manufactured by the Chicago Pneumatic Tool Co., Chicago, is designed for riveting small light parts that can best be handled in a stationary machine, and is constructed so that the machine can be operated by a foot lever. The yoke consists of a steel frame mounted in the end of pipe column. The base is provided with bolt holes to permit its being securely fastened to the floor. The standard yoke has a gap of 8 inches and a reach of 11 inches. Additional yokes may be obtained of any desired dimensions to accommodate larger work.

Where it is desirable to handle more than one size rivet a special dolly is supplied that will accommodate four different size rivets. The



HEAVY DUTY DRY PAN



BOYER PEDESTAL RIVETER

riveter head is a standard Boyer riveter and is held in a clamp which permits adjustment to take care of the wear on the dies or the variation in length of rivets.

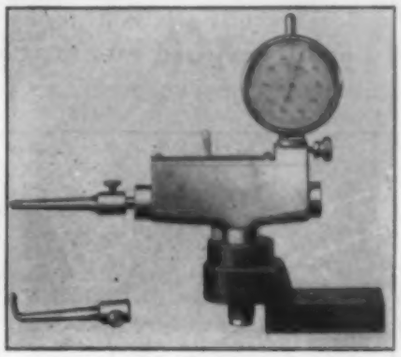
Designs Dry Pan

The Stevenson heavy duty dry pan, which is manufactured by the Stevenson Co., Wellsville, O., is equipped with a rigid iron frame, carrying adjustable bearings for the drive shaft, and an iron support for the end carrying the friction pulley. The pans can be driven from either side, the shaft support for the friction pulley being reversible. The drive shaft is made from 4-inch cold rolled steel and is keywayed in two places in order that the pinion may be placed on either side of the main gear, allowing the pan to be driven either to the right or to the left. The friction clutch pulley is 48 inches in diameter with an 18-inch face fitted with a bronze bushing and averages 140 revolutions per minute. The main gear is 72 inches in diameter with an 8-inch face and 6½-inch bore. The pinion is 18 inches in diameter with an 8-inch face and 4-inch bore. Both can be furnished in either cast iron or steel. The upright shaft is made of hammered wrought iron. The rolls are 50 inches in diameter with 12-inch faces, each weighing 6,500 pounds. The false plates on which the rolls tread are 2½ inches thick, and may be furnished in either four or eight pieces. The screen plates may be supplied in any desired mesh up to ½-inch. The total weight of the pan is 39,500 pounds. In modern systems the sand is hauled away in an elevator as indicated in the illustration.

Reading Gage

The Climax Motor Devices, 759 Rose building, Cleveland, is introducing an instrument manufactured by the Industrial Products Co., Chicago, for accurately indicating the variations in the diameter of work that is being ground on an external or internal grinding machine. It is claimed that by means of this device the operator of a grinder may at all times know within 0.0001-inch, the variation between the size of the work and the finished size of the piece.

The instrument consists of a polished diamond pointed rod attached to an encased mechanism which transmits the horizontal movement of the diamond point to an Ames gage. The reduction is such that the movement of the diamond through the distance of 0.001-inch causes the hand on the dial to move from 0 to 10. The instrument as shown in the accompanying illustration is pivoted on a support attached to the frame of the machine. If a master gage of the finished piece is at hand, it is placed between the centers of the machine and revolved. The diamond point is brought up against the surface of the master gage. The reading on the dial indicates the size to which the rough pieces must be ground. The master gage is removed and the operator, in grinding



CONTINUOUS READING GAGE

the work, has only to watch the dial. When the reading corresponds to that registered when the master gage was revolved, the operator knows that the piece has been ground to the correct size. If a master gage is not used, the rough piece may be ground until a true cylindrical surface has been formed. The diameter of this may be calipered, and after determining the reduction necessary to bring the stock to finished size, the operator may proceed with the grinding. When the dial reading shows that the diameter has been reduced an amount equal to the correct size, the work is finished.

A Correction

The temperature, 860 degrees Cent., given in Table II on page 736 of the Oct. 12 issue of *The Iron Trade Review*, accompanying an article on "Is Sulphur Injurious to Steel?" by Carle R. Hayward, should have read 880 degrees. In Table IV the temperature 480 degrees also should have read 880 degrees.

Several changes have recently been made in the officers of the Iroquois Foundries, Inc., Utica, N. Y., manufacturer of aluminum, brass and bronze castings. The new officers are: Charles T. Uebele, president; L. H. Uebele, vice president, and Fred Widmer, secretary, treasurer and general manager.

Sparks from the Grinding Wheel

By H. O. Tair

THE Wheeling & Lake Erie has ordered ten "mallet" type locomotives from the American Locomotive Co., with works at Richmond, Va., and Dunkirk, N. Y. Must be going to have "some" drive of their own.

* * *

It is reported that the Cuban potash fields that gave so much promise have proved a fizzle. We wonder how many sold their all for a mess of potash.

* * *

The Carnegie Steel Co. has secured a contract for 5,000 tons of material for the center span of the Quebec bridge. It's an ill slide that doesn't slip somebody good.

* * *

More Activity in Chicago Stock Yards.

A headline in *The Daily Iron Trade and Metal Market Report* states the "pig market drive may continue this week."

* * *

The same issue informs us "standard spikes are easy". In all probability this sort would have been welcome to the Scotch Covenanters when they were placed on the rack in the days of religious persecution.

* * *

In Mexico there is a mountain near Durango 640 feet high, 4,800 feet long and 1,100 feet broad which is said to be almost a solid mass of iron. It is called Cerro del Mercado.

If our border boys had sufficient faith, this mountain would doubtless be removed to Washington, where it could be exhibited to future generations as a wonderful sample of ultra-precious metal.

* * *

The Russian Steel Trust is called *Prodamet* in Russian. Very handy, when they can't secure orders all they need do is repeat the name—to show they're peeved.

* * *

Wilson—That's All.

T. A. Willson & Co., Inc., Reading, Pa., is to manufacture eye protectors adopted by the United States government and within a few months 75,000 enlisted men will be equipped with them.

Is this the latest campaign advertising stunt?

* * *

Herr Mettler of Berlin stated at the annual meeting of the Association of German Iron Founders, held recently, that under war conditions Germany has succeeded in producing an iron which has more than twice the electro-chemical properties of copper and that Germany's future lies in the electric furnace.

Remaining neutral, we would say, it will likely take more than an electric furnace to hatch that future.

* * *

It is stated by Prof. Chas. E. Lucke, of Columbia University that experiments recently made, show that kerosene can be utilized in place of gasoline.

We don't know who will be the most "lucke" the professor, the automobilist or the same li'l ol' Standard Oil.

Lest we forget,

Edward *G. Miner* is with the Pfaudler Co., Rochester, N. Y.

Chester *A. Orr* is with the Cleveland Metal Products Co., Cleveland, O.

Robert *H. Irons* is with the Central Iron & Steel Co., Harrisburg, Pa.

H. M. Steele is with the American Sheet & Tin Plate Co., Farrell, Pa.

Robert *R. Rust* is with the Central Foundry Co., New York City.

* * *

We Have Reached the Iron and Steel Age at Last.

A very eminent iron master has estimated that the net earnings of the steel companies during current year, without taking munitions into considerations, will reach $600,000,000.00.

* * *

Over 9,500,000 tons of ore from the Lake Superior district came down in the month of June. About 19,500,000 tons have arrived since the opening of navigation. Should not the national emblem be changed?

* * *

Two years of war have made U. S.
Afraid of armed invasion,
And Mexico, with U. S. arms,
Has added her persuasion.
Preparedness now is the theme,
From Texas to Alaska;
If this we choose,
Why must we lose
The peace dove of Nebraska?

Pulverized Coal for Open Hearths

A Comprehensive Discussion of the Use of Powdered Fuel in Metallurgical Furnaces—The Author Describes the Manner in Which Coal is Prepared and Introduced Into the Furnaces

BY JAMES WHEELER FULLER

THE development and use of pulverized coal in this country has been primarily due to its application in the cement industry and its gradual application to other types of metallurgical furnaces. Marked economies, and in some cases increased production, have been obtained from this fuel and within the last few years it has been applied very successfully to various kinds of heating furnaces, including forging, continuous heating, busheling, puddling and open-hearth furnaces. Pulverized coal is being used on continuous heating furnaces with very gratifying results. It is also being used as a fuel for soaking pits and promises to be used more extensively on this type of heating furnaces in the future.

One of the first applications of pulverized coal to the various types of metallurgical furnaces was made by the American Iron & Steel Mfg. Co., Lebanon, Pa., where this form of fuel was successfully applied to heating, busheling and puddling furnaces, this being practically the first attempt to apply it to the iron and steel industry.

Probably the greatest recent development in its use has been as a fuel for open-hearth furnaces. Observations of its use up to date show that a more regular supply of heat is given to the furnace, as it is much easier to burn powdered fuel to gas than it is to gasify coal in the ordinary gas producer. In other words, the gas is of a more even chemical composition, which should result in a greater number of heats per week.

Open-hearth furnaces are in operation using powdered fuel with very low fuel consumption equal to the best producer gas practice, and much better than the

A paper read at the St. Louis meeting of the American Iron and Steel Institute, Oct. 27-28, 1916. The author is president, Fuller Engineering Co., Allentown, Pa.

Papers Read at Institute

FOUR of the five papers read at the St. Louis meeting of the American Iron and Steel Institute were devoted to subjects pertaining more or less directly to the business of producing steel economically. The account of the success of the duplex process by Mr. Waterhouse, the discussion of the use of pulverized coal in metallurgical furnaces by Mr. Fuller, and the description of New York's iron ore resources by Mr. Witherbee will be found in this issue of The Iron Trade Review. Arthur J. Boynton discussed the modern development of hot blast stoves. This interesting paper will be presented in an early issue of The Iron Trade Review after important investigations on the performance of hot blast stoves now being conducted by Mr. Boynton, have been completed.

FIG. 1—VIEW OF PULVERIZING UNITS IN A COAL PLANT RECENTLY CONSTRUCTED

average of the older plants in this country. Moreover, coal can be pulverized and delivered to the furnace for approximately 35 cents as compared to 60 cents for gas producers.

It is possible to obtain, by the use of pulverized coal, as large a production of steel as by the use of fuel oil, and the substitution of pulverized coal for producer gas in most instances gives an increase in production which may amount to between 10 and 40 per cent, according to the nature of the practice.

Furthermore, pulverized coal installations cost less than gas producers. It is believed that there will be 1 per cent to 2 per cent less oxidation in pig iron and scrap in melting down a heat.

The best coal for use in open-hearth practice is a bituminous coal as high in volatile matter as possible and preferably low in ash. A coal having 0.64 per cent moisture, 35 per cent volatile matter, 50 per cent carbon, 5 per cent ash and 1.36 per cent sulphur gives excellent results. A coal of this analysis has a heating value of 14,200 British thermal units.

Oxidation Losses Reduced

Unless the coal is pulverized to a very high degree of fineness and the efficiency of the burner is high, combustion will not be complete before the gases come in contact with the metal in the bath. This would cause excessive oxidation loss as there would be, with incomplete combustion, free oxygen in these gases which very readily attacks the charge

FIG. 3—BIN, FEEDER AND BURNER OF 50-TON OPEN-HEARTH FURNACE USING PULVERIZED COAL

at the temperature within the furnace at this period of operation. It has been shown that by having combustion complete immediately after the fuel enters the furnace and minimizing free oxygen in the gases when they come in contact with the metal in the bath, oxidation losses are reduced from 1 to 3 per cent below the average practice of other fuels.

The most important point depending upon complete combustion is to keep the sulphur in the fuel from going into the charge. Sulphur as it enters the furnace is mechanically mixed with the coal in pyrite form, and unless combustion is immediately completed so that all the sulphur is burned to sulphur dioxide and is allowed to pass out the stack with other waste gases, it is apt to combine with the iron, which is very undesirable, as it requires additional time to remove it from the charge before tapping the heat.

Physical Conditions

It has been found that for high furnace efficiency the velocity of the gases must not be very great. With high velocities the coal is not entirely consumed before the gases leave the furnace and a great deal of its heating value is lost in the outgoing gases, aside from the increased amount of trouble experienced due to the unburned or fused particles of carbon and ash being carried over into the regenerator chamber, causing the checkers to become clogged up after a short time.

In order to obtain a maximum number of heats before rebuilding the checker work in the regenerative chambers, it is very essential to provide means for easy cleaning out of these chambers. Another item of great importance is to have a removable slag pocket or its equivalent placed between the furnace and regenerative chambers, so that all of the heavier and fused particles of carbon, ash and slag which may be in the flue gases will be removed before they reach the checker work in the regenerative chambers. This has been acomplished in several plants, and

FIG. 2—VIEW OF A 50-TON OPEN-HEARTH FURNACE USING PULVERIZED FUEL, SHOWING THE BINS OVER EACH END OF THE FURNACE

every week-end these slag pockets are removed and new ones put in their place in less than 40 minutes per furnace. It is also well to remember that in designing the slag pockets of a furnace, it is an advantage to give the gases a centrifugal motion on their way to the regenerative chambers, so as to facilitate the removal of the heavier particles which might do considerable harm if allowed to pass on to the regenerative chambers.

Now, in reference to regenerative chambers, they should be of ample size to afford sufficient surfaces for contact with the gases. With powdered coal as fuel the most satisfactory checker brick to use is a regenerative tile having dimensions of 21 x 9 x 3 inches, laid in such a way as to form a vertical flue having openings of at least 6 x 9 inches, or, better, 9 x 11 inches.

In reference to the regenerator tiles themselves, it is good policy to provide means of blowing the accumulation of ash and soot off the top courses between each heat, or at least once a day, thus allowing it to settle through the checker into the rider walls, from where it can be easily removed. It is also advantageous to provide small doors or openings along the side of the regenerator chambers, so that after a run of 150 to 160 heats it will be possible to remove the first one or two courses of regenerator tiles by the use of peel.

Referring to Fig. 4, which is a drawing of an ideal small pulverized coal plant, it will be seen that the raw coal is received in a track hopper from the bottom of which it is discharged on to a belt or pan conveyor, delivering it either directly to the boot of an elevator or through a pair of crushing rolls, in case run of mine coal is to be used. This elevator raises the coal and discharges it into a bin placed above the feed end of a rotary drier, through which the coal passes while the moisture is being removed, and is discharged from the drier directly into an elevator, which elevates and discharges the dried, crushed coal into a storage bin above the pulverizer mill. From this bin it is fed through a spout into the feed hopper of the pulverizer. The powdered coal is discharged from the pulverizer into an elevator, which elevates it and delivers it into an overhead screw conveyor which delivers the coal to the individual furnace bins.

First the tramp iron is removed from the coal by means of magnetic separators. Coal as delivered to the milling plant always contains an astonishing amount of tramp iron in the form of bolts, nuts, rivets, nails, bar iron, railroad spikes, mule shoes, etc. Any of these materials entering the crusher or pulverizer might result in damage to the machine, with consequent delays in operation.

Removing Tramp Iron

The foreign material can be entirely eliminated by the use of a magnetic separator located at some point ahead of the crusher. Magnetic separators may be either of the stationary lifting type or revolving pulley type. The stationary lifting type of magnetic separator is generally placed in the bottom of a chute through which the material passes. Any tramp iron passing through this chute and over the magnetic field is firmly held to the magnetized part of the chute and should be removed periodically by the operator in charge of this equipment. The pulley type of magnetic separator consists of a pulley revolving about a magnet. This pulley serves as a head wheel of the belt conveyor. When the material passes over the above pulley which contains the magnet, the magnetic material, consisting of tramp iron, is attached and held firmly against the belt and remains in contact with the belt until it leaves the magnetized zone, which is at some point beyond the under side of the magnetic pulley. The tramp iron drops from the belt after it leaves the pulley and is delivered to the suitable boxes by means of a chute, the coal continuing on its course.

Crushing

The coal as received should be reduced in one operation to a proper size for pulverizing, the type of crusher depending upon the condition of the coal. A mixed feed containing all of the various particles resulting from reducing the material so that it will pass

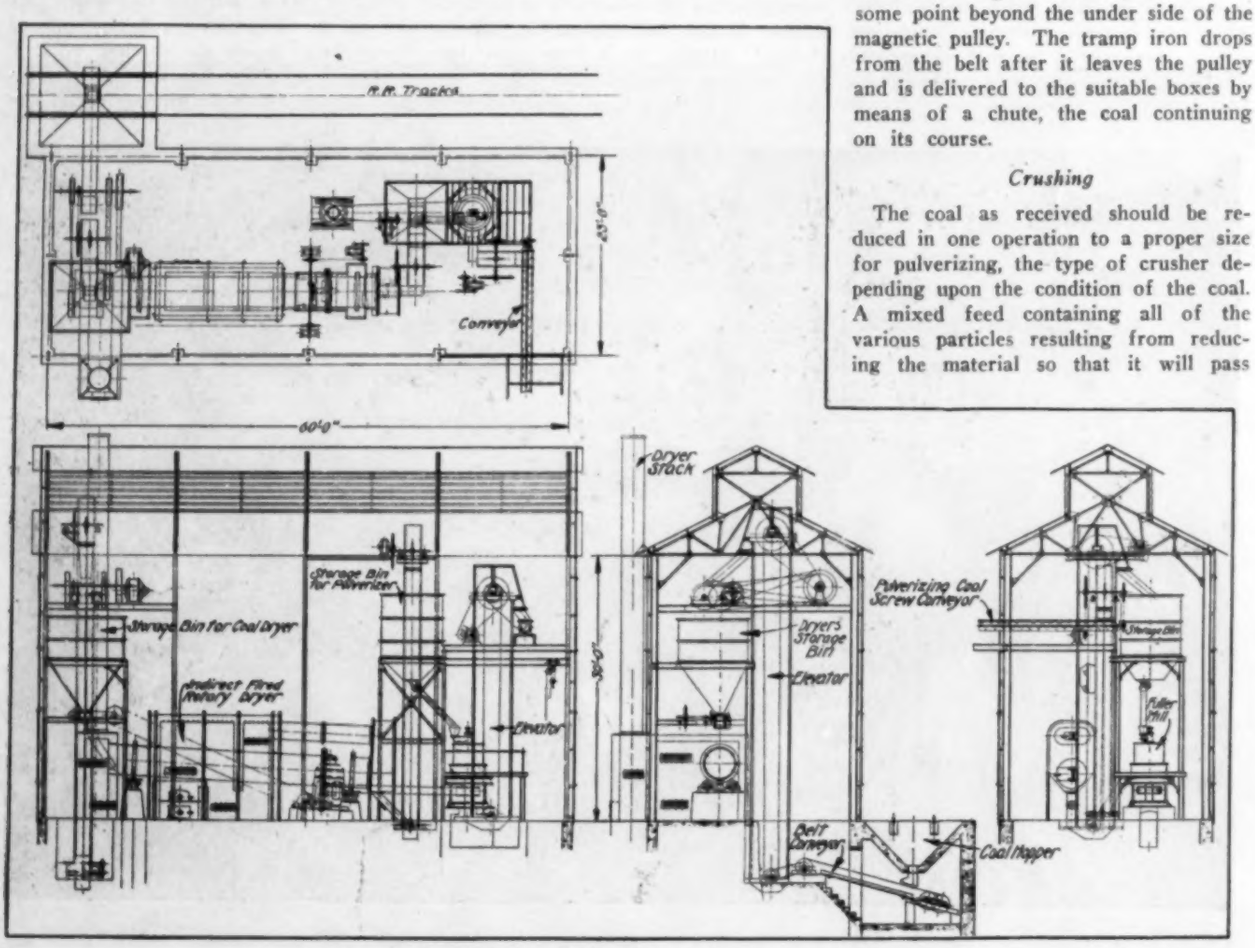


FIG. 4—PLAN AND ELEVATION OF PLANT FOR PULVERIZING COAL

through a 1-inch ring is an almost satisfactory feed. This feed when delivered to the pulverizer mill is distributed uniformly in the grinding zone, rendering the grinding elements most efficient and producing the best results.

Drying

In order to obtain a product having a high percentage of impalpable powder, coal fed to the pulverizer mill should not contain more than 1 per cent of free moisture. Coal that is air-dried, either in open or closed storage, will not be satisfactory. One type of drier usually installed in coal milling plants is the indirect fired rotary drier illustrated in Fig. 5.

The indirect fired rotary coal drier consists of an axially inclined cylindrical shell equipped with suitable rollers and gearing to permit the shell being rotated on its longitudinal axis. The higher end of the drier shell terminates in a brick housing, which serves to support the stack which is supplied, to discharge the products of combustion from the furnace and the vapor given off by the drying of the coal. The lower end of the shell terminates in a steel hood. The furnace is provided with a large combustion chamber through which the cylindrical shell passes. The entire furnace is built of brick and the walls are securely bound together by means of buck stays and tie rods.

The moist coal is fed into the drying shell by means of a cradle or swinging feeder, shown in Fig. 8, which can be regulated to discharge a given amount of coal per hour, through a feed spout located in the stack chamber. This spout enters the drier shell and delivers the coal close to the bottom of the shell. A series of longitudinal shelves fastened to the inside of the shell lifts the coal and drops it through the current of heated air passing through the inside of the drier shell. As the revolving shell of the drier is slightly inclined, towards the discharge end, the coal travels the entire length of the shell and is finally discharged perfectly dry from the lower end of the drier. The hot gases from the furnace fire circulated freely around the outside of the drier shell, passing through the combustion chamber of the furnace. They then leave the combustion chamber through the horizontal breeching and enter the top of the hood at the lower end of the drier. From this hood the hot gases flow through the interior of the drier shell, removing the moisture which has been driven off from the coal and then escaping to the atmosphere through the stack.

In order to obtain high efficiency of combustion, powdered coal should be reduced to a fineness so that at least 95 per cent will pass a sieve of 100 meshes to the linear inch, 85 per cent passing a sieve of 200 meshes to the linear inch, and at the same time have as much as possible pass a sieve having 300 meshes per linear inch. The greater the degree of fineness, the higher the efficiency of combustion as a gaseous condition is being approached.

The material to be reduced is fed to the mill from an overhead bin by means of a feeder mounted on top of the mill. This feeder is driven directly from the mill shaft by means of a belt running on a pair of three-step cones, which permits the operator to regulate the amount of material entering the mill. In addition, the hopper of the feeder is provided with a slide, which permits the operator to increase or decrease the amount of material entering the feeder hopper. The material leaving the feeder enters the pulverizing zone of the mill in such a way as to insure proper and uniform distribution. The pulverizing element consists of four unattached steel balls which roll in a stationary, horizontal, concave-shape grinding ring. The balls are propelled around the grinding ring by means of four pushers attached to four equidistant horizontal arms, forming a portion of the yoke, which is keyed direct to the mill shaft. The material discharged by the feeder falls between the balls and the grinding ring in a uniform and continuous stream, and is reduced to the desired fineness in one operation.

The fan discharge mills are fitted with two sets of fans. One of these fans operates in the separating chamber immediately above the pulverizing zone, whereas the other fan operates in the

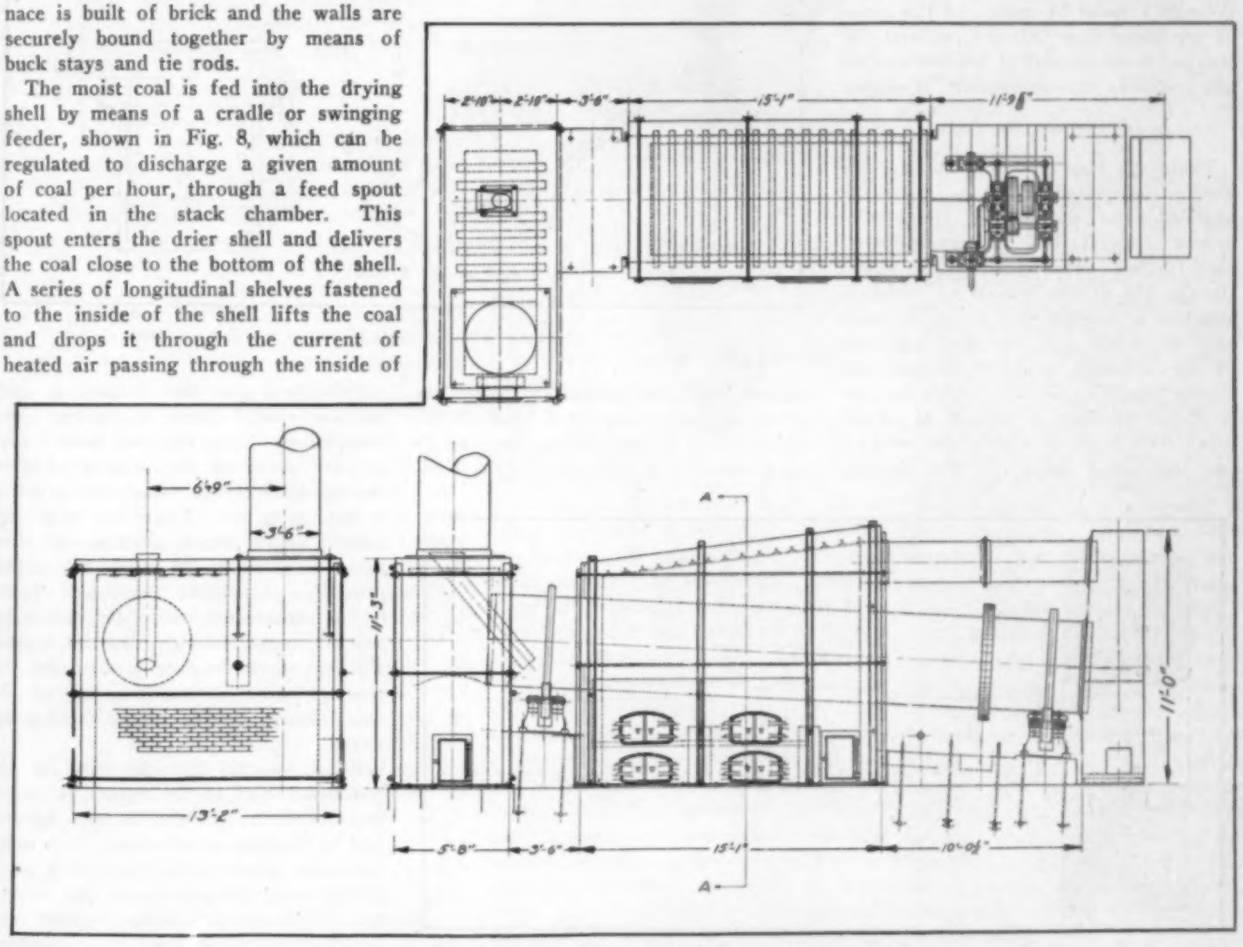


FIG. 5—DRAWING OF INDIRECT FIRED ROTARY DRIER

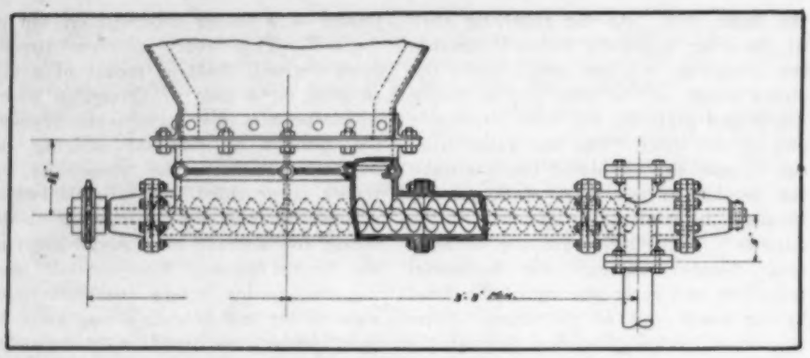


FIG. 6—PULVERIZED COAL FEEDING MECHANISM

fan housing directly below the pulverizing zone. The upper fan lifts the fine particles of pulverized coal from the grinding zone into the chamber above the grinding zone, where these fine particles are held in suspension. The fan in the chamber directly above the grinding zone is composed of two sets of blades. The lower set of fan blades raise the pulverized coal from the grinding zone while the upper set of blades throw the coal tangently against the finishing screen, which completely surrounds the mill at this section. The material after passing through the finishing screen is drawn into the lower fan housing, from where it is all discharged through a spout by means of the action of the lower fan. All the material discharged from the mill is finished product and requires no subsequent screening.

Conveying the Fuel

There are two systems used for conveying pulverized coal in successful application at the present time. One system conveys coal pneumatically to each furnace. This system consists of a storage bin to the bottom of which is attached a feeding device which feeds coal uniformly into the discharge side of an ordinary pressure blower, the blower supplying air with which the coal is blown through a system of closed pipes with taps, in taking the coal off and delivering same to the furnace burners. The surplus coal and air which is not required at the furnace is returned into a cyclone collector, which is located over the pulverized coal bin, where the coal is separated from the air and returned to this storage bin, the air being returned to the fan, thereby eliminating loss of coal which might otherwise go into the atmosphere. This system has been used with successful results and finds its best application in plants where a small amount of coal is delivered to a large number of small furnaces. It is economically constructed and the depreciation is very slight.

By the other system and the one which is in practically universal use in plants grinding a considerable amount of the total tonnage of coal pulverized, the coal is delivered to a bin near each furnace by means of screw conveyors in dust-tight, steel troughs. This system has proved to be very positive and economical from both standpoints of power consumed and maintenance of equipment, and is highly efficient.

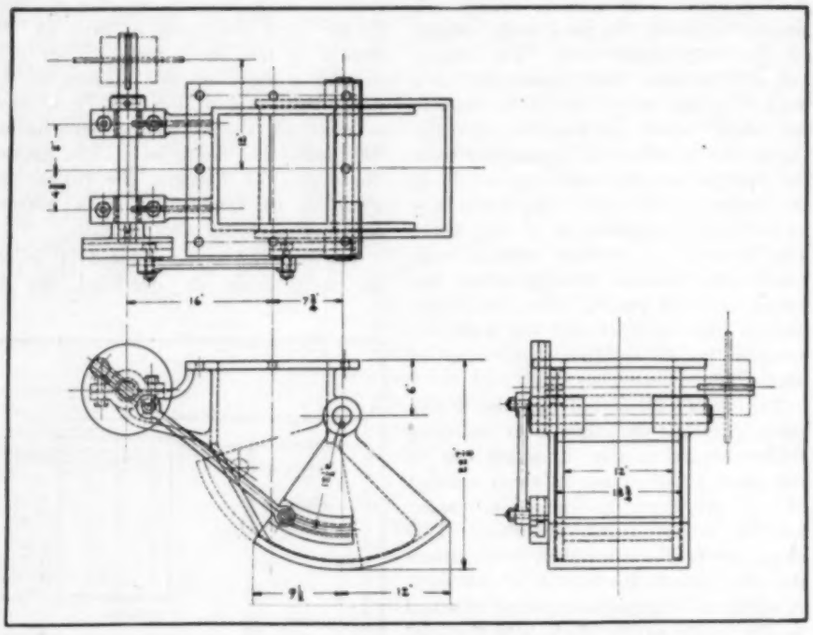


FIG. 8—GENERAL ARRANGEMENT OF CRADLE FEEDER

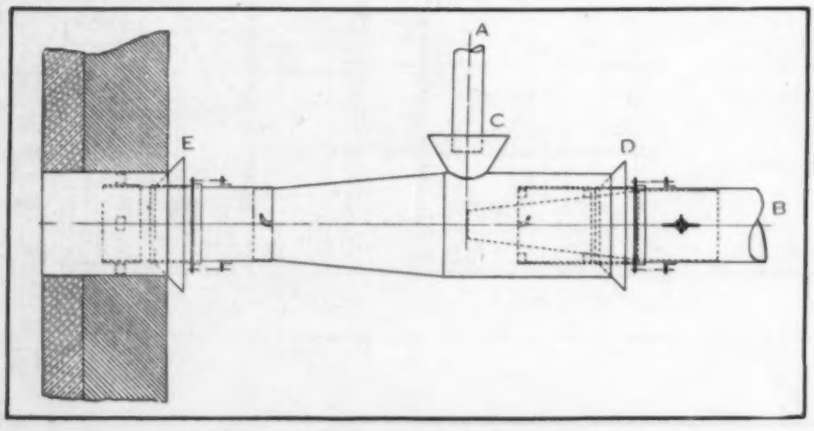


FIG. 7—BURNER FOR PULVERIZED COAL

Pulverized coal bins located at each furnace should have a capacity proportional to the service and hold a supply in excess of the amount required during the intervals when the grinding is not going on. Thus the mills may supply in 10 hours all that the furnaces may use in 24 hours by making provisions therefore. These bins should be so constructed as to be dust-proof and of such a design that no trouble will be experienced from the coal becoming caked or hanging up on its way through the bin to the feeding device.

It is essential that the feed of the pulverized coal to the burner be under absolute control of the furnace operator and be positive at all times. Too much emphasis cannot be laid upon this point. If the feed of pulverized coal to the burner is not absolutely regular and positive, the efficiency of combustion will be very materially lowered and

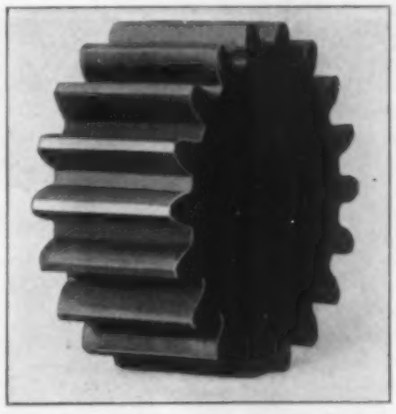
puffing at the furnace will take place, which, of course, is very undesirable. If the feed is not positive at all times a regularly uniform condition cannot be obtained in the furnace. A type of feeder which is very widely used and has proved to give excellent results in a large number of installations is illustrated in Fig. 6. The feeder is provided with a long screw conveyor mounted in a substantial housing. The coal enters the feeder through a large hopper, which is fastened to the bottom of the storage bin containing the supply of pulverized coal for the furnace. It is very important to have a large hopper, so that at all times the screw conveyor will be surrounded with pulverized coal, thereby insuring a uniform feed.

The feeder hopper is provided with slide gates to permit shutting off the supply of fuel when desired. The housing in which the feeder screw revolves is bored to a neat fit to suit the feeder screw to prevent any flushing of the pulverized coal which might take place if the screw did not closely fit the section of the feeder housing through which it passes. The power required to operate the feeder screw is nominal; a 1½-horsepower motor furnishes sufficient power to drive a 5-inch feeder which has a capacity of 2,600 pounds of pulverized coal per hour when operated at 60 revolutions per minute.

Burners

Fig. 7 shows a pulverized coal burner from which excellent results have been obtained. It will be noted that the pulverized coal is discharged from the feeding device into pipe *A* which drops the coal into the burner. Air from a fan at a few ounces pressure enters from the pipe *B* and produces an injector action which draws the coal and air into the burner through the opening *C*. It also induces air at *D* the amount of which is controled by a cone fitted over the air pipe and arranged so it can be moved back and forth, controling the amount of air admitted. The coal mixed with the air passes into the furnace as shown on the drawing. Any additional air required for combustion is induced at the point *E* and such air is controled by a sliding cone similar to the one at the point *D*.

The volume of air, which is between 20 and 30 per cent of air required for combustion, is supplied from a fan and is controled by a blast gate inserted in the line. This air carries the coal into the furnace. In the nozzle of this burner is inserted a jet of compressed air which serves not to increase the velocity of the coal and air entering the furnace but merely to properly mix the coal and air so that each individual particle of coal is independently suspended in air. When these conditions exist, the proper amount of air for combustion, of which between 70 and 80 per cent is supplied through the regenerator or recuperator of the furnaces, can instantly surround each particle of coal thereby producing ideal conditions for immediate and complete combustion of the coal. It will be noted that this burner is supplied with a nozzle which is flexible so that the flame can be directed to any part of the furnace desired. This burner is generally used in connection with open-hearth and other types of melting furnaces. This is due to the fact that the nature of the flame can be made less oxidizing and can be directed upon any piece of material in the furnace to be melted. The length of the flame can be controled to a great extent by varying the two different pressures of air. This is a considerable advantage in the rapid melting of an open-hearth charge, with less oxidation losses, than would normally occur under the same condition with most other fuels.



NEW NOISELESS GEAR

New Gear Material Eliminates Noise

A strong non-metallic gear has recently been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These gears are made of heavy duck bonded together with bakelite by heating while under an enormous pressure. They are claimed to be as strong as cast iron and are unaffected by atmospheric changes. The gears may be stored indefinitely without shrinking or other deterioration. In most cases neither bushings or shrouds are required as the material is self-supporting. Where the requirements are unusually severe, however, or where the diameter of the gear is several times the width of the face, end plates may be advisable, but even in such cases the teeth need not be shrouded, and the width of the gear is determined only by the power to be transmitted.

Bakelite gears may be machined in any direction and may be drilled and tapped readily. The same tools used for steel are employed in cutting teeth, but an increase in cutting speed of 25 per cent and an increase of feed of 50 per cent may be used. The depth of material from the root of the tooth to the bore should never be less than the depth of the tooth. At present this material is not made in thicknesses over 2 inches. If gears having a face of more than 2 inches are required, two or more plates must be riveted together, using metal end plates or standard washers under the rivet heads.

The physical qualities of this material are as follows: Tensile strength, parallel to laminations, 10,000 pounds per square inch; compression strength, 30,000 pounds per square inch perpendicular to laminations, and 17,000 pounds per square inch parallel to laminations; transverse strength, 17,000 pounds per square inch; coefficient of expansion per inch per degree Cent., 0.00002-inch in the direction parallel to laminations and 0.000085-inch in the direction perpendicular to laminations. It has a specific gravity of 1.4, weighs 0.05 pound per cubic inch, and has a water absorption of 0.25 to 2.0 per cent by weight, depending upon the relative amount of edge surface exposed. Shrinkage and oil absorption is practically zero.

The life of these gears has been satisfactory under severe service conditions and in a large variety of applications, such as timing gears for automobiles, main driving gears for punch presses, boring mills, engine lathes, pressure pumps, crane motors, textile machinery and general machine shop service.

Automobile timing gears can usually be made from solid plate. In case it is necessary to have a web gear, in order to allow for clearance, it is preferable to use a metal hub and web, only the teeth and rim being made of non-metallic material. Spur, bevel and helical gears, when made from bakelite, should be used in mesh with metal gears, and in order to operate satisfactorily both gears must be cut true, lined up accurately and properly spaced between centers. The allowance for back lash should be about double the usual allowance for steel. Lubrication of bakelite gears is essential. Any good lubricating oil or grease will answer, but there should be plenty of it. Rough or worn teeth of mating gear or bad alignment will cause vibration and rapid wear.

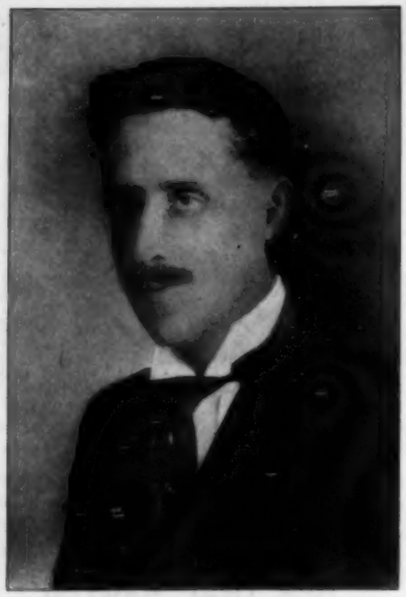
Authors of Institute Papers

CLARENCE H. HOWARD,
President, Commonwealth Steel Co., St. Louis.

AT this time when the fate of the nations of Europe is dependent upon the manufacture of iron and steel, data relating to the underlying processes of the industry are of exceptional interest. In view of this fact, the five excellent papers presented before the members of the American Iron and Steel Institute at their fall meeting at St. Louis, Oct. 27-28, have particular importance:

Clarence H. Howard introduced the visiting members to their surroundings through the medium of a paper on "St. Louis and Its Industries." Mr. Howard as president of the Business Men's League of St. Louis and of the Commonwealth Steel Co., Granite City, Ill., was particularly well qualified to perform this introduction and the sight seeing trip arranged for Saturday, which would have proved both entertaining and instructive without any preliminary words of explanation, was rendered doubly so by Mr. Howard's address of the previous day.

The duplex process was discussed by George B. Waterhouse, metallurgist for the Lackawanna Steel Co., Buffalo, N. Y. The advantages of this combination of the acid-bessemer converter and basic open-hearth processes

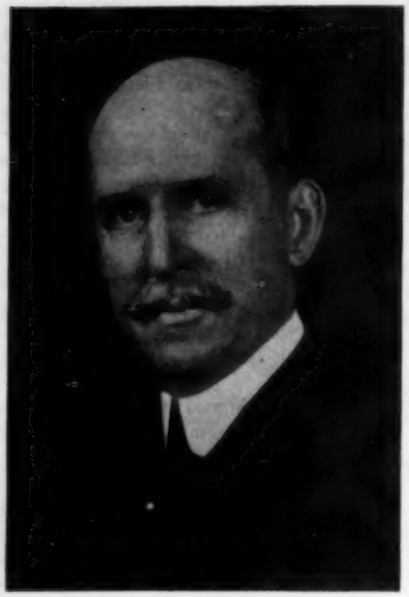


GEORGE B. WATERHOUSE
Metallographist, Lackawanna Steel Co., Buffalo, N. Y.

give it considerable importance right now when managers are earnestly striving for increase of output and decrease in the unit time of production.

As the practice of using pulverized fuel in furnaces is of comparatively recent origin a discussion of the economies which result from the utilization of this material was of value. James W. Fuller, president, Fuller Engineering Co., Allentown, Pa., in a paper entitled "Pulverized Coal as a Highly Efficient Fuel for Metallurgical Furnaces" described the development and use of powdered fuel.

Frank S. Witherbee, president, Witherbee, Sherman & Co., New York, read a paper on "The Iron Ores of the Adirondack Region."



FRANK S. WITHERBEE,
President, Witherbee, Sherman & Co., New York

Mr. Witherbee's intimate acquaintance with his subject lends accuracy to his description and gives his statistics great weight.

"Progress in Hot Blast Stove Design" is the subject of a paper presented by Arthur J. Boynton, superintendent of blast furnaces, National Tube Co., Lorain, O. Improvements both in stove design and construction were fully outlined by Mr. Boynton, special attention being paid to the progress of the past five years.

ARTHUR J. BOYNTON,
Blast Furnace Superintendent, National Tube Co., Lorain, O.

JAMES W. FULLER,
President, Fuller Engineering Co., Allentown, Pa.

Many Opportunities in Far East

Judge Gary in Address at St. Louis Meeting of Iron and Steel Institute Points Out Possibilities for Cementing Trade Relations in Orient— Japan Wants Peace and China is Awakening

I LEFT New York on July 3 for Toronto and from thence proceeded via the Canadian Pacific railroad to Vancouver; sailed on the EMPRESS OF ASIA July 13; arrived at Yokohama July 24, and from there went on the same steamer to Manila, arriving July 31. I left Manila on another ship (Japanese) Aug. 7 for Hong Kong, overtaking the EMPRESS OF ASIA, which had preceded the Japanese ship, and sailed for Shanghai. From there I went through portions of China (visiting Peking, Soochow, Nanking and various other places in the eastern and northern part) to Mukden, in Manchuria, Seoul, in Korea, and then across the Japan sea or Strait of Korea to Shimonoseki, in Japan, arriving Aug. 29. I remained in Japan until Sept. 14, when I embarked on EMPRESS OF RUSSIA for Victoria, B. C., arriving Sept. 23. I visited the principal cities in Japan and motored considerably through the country, as I also did in China and the Philippines, wherever practicable.

This brief outline has been given because I am hoping many of my readers will be inclined to inquire into the details and then to personally inspect this fascinating portion of the earth situated on the opposite side of the globe from your habitation. I will later suggest reasons for my wish.

The Philippine Islands, with proper development and modern practice, are capable of supporting comfortably ten times, or more, the number of people now living within their territory. There can be produced everything indigenous to semi-tropical latitudes and many things to better advantage than on any other lands within the same proximity to the equator. Hemp, tobacco, sugar, rice, cocoanut oils, coffee, fruits, vegetables, grains, choicest timber and multitudes of other valuable products can be raised in as large or larger abundance than in any other country, with comparatively slight exception. The natural requisites, including moisture, water power and particularly richness of soil, are all sufficient. The climate is equable and excellent. In the summer, it is warm during the middle of the day, but the nights are agreeable, and, on the whole, the temperature seemed to me very much better than the average. No doubt the records will show favorably by comparison. The Filipinos, as a race, are a fine people, intelligent, of good disposition and possessed of capacity for success. I met large numbers of them, confined perhaps to the better educated classes, but nevertheless representative. With opportunity, example and precept they will take a desirable place in the ranks of progressive and worthy citizens.

When the United States paid nearly $20,000,000 to Spain, the owner, for the title to the Philippine Islands, we acquired a territory possessed of all the essentials for building up a rich, healthful and desirable extension of our dominions as a valuable and necessary implement to the immense productive capacity which we already possessed; and it was inhabited by a people who, by nature, would readily become loyal and faithful citizens of our country. When the United States, by mere chance, or as the result of an overruling Providence, became responsible for the future welfare of the inhabitants of the islands and for the conditions which might directly and seriously affect other countries, especially those in proximity, there was much in the condition of the people to be deplored. The masses were ignorant; perhaps purposely deprived of education; and they were subjected to tyranny and cruelty. They were poor, unhealthy, diseased, overtaxed and wretched. They were more or less at war with each other and with their government. Every influence, every tendency, was bad. They had no hope for the future. Intelligent happiness was neither a reminiscence nor even an aspiration. Because of

Judge Gary on the Business Situation

IT IS well known that the steel business in this country is better than ever before. Our concern is only for the future. Many believe there will be a continuance of large business for many months or years after the war closes; others think there will be a material recession. No one can certainly foretell. I have heretofore expressed opinions on the subject which have been published. Obviously the wise man will husband his resources, keep within safe limits and avoid over-extension. It is better to be prudent and make less profits than to become reckless or extravagant at the risk of calamity. With large bank balances we are independent and secure; with large indebtedness to the banks which we could not readily pay, we would be in danger of bankruptcy, depending upon future business conditions. All this we know by the experience of the past. As we cannot read the future we should exercise caution and be prepared for unfavorable changes.

Whenever the war shall close, the business of this country will be confronted with new conditions. The purchasing power of the whole world will have been very greatly reduced. Foreign countries that are now buying our products, because compelled, will withdraw their patronage in a large measure. Other non-producing countries will find their financial resources and credits lessened. More than this, foreign producers, in great need, will strive more diligently than ever to supply the countries that are financially able to pay and at prices based upon cheap labor and low costs, as they have a perfect right to do.

Our producers, including our wage earners, will find themselves in commercial antagonism with the most persistent and difficult competition ever experienced, unless this shall be prevented by laws that are reasonable and sufficient. Most of the foreign producing countries, and quite likely all of them, will be thoroughly protected by tariff provisions and we should be on a parity with them in this respect.

I firmly believe, if the present unprotective tariff laws remain unchanged, we shall probably meet with competition from foreign sources after the war closes which will adversely, and perhaps disastrously, affect American industry and American labor. Conditions will be even worse than they were between Oct. 1, 1913, and the beginning of the war. If the laws shall be amended and adequate protection to American producers and their workmen is afforded, we may expect satisfactory business conditions for some time to come.

the disease prevalent, both the people and their beasts of burden were a menace to the outside world. The Filipinos were not blamable for this situation; they deserved a better fate.

There has been established in the Philippines a sound and exemplary government. The laws are wisely and justly administered by able and impartial judges; modern and commodious hospitals have been built and are in charge of competent, practical and humane doctors and nurses; plagues and dreadful contagious and infectious diseases have been largely stamped out; model schools, special and common, have been established, and they are filled with eager and industrious Filipinos taught in the English language. Good roads have been built; agriculture, horticulture and forestry have been improved; means and methods for civilization and for modern practical results have been taught, though, of course, much remains to be done.

The United States assumed a moral obligation to the Filipinos and to other nations when she took charge of these islands. She could not shirk it if she wished to do so. Moreover, if the Filipinos desire it, as I believe they do, and if the United States, as I think a majority of the citizens wish, shall decide to have the Philippine Islands remain permanently a part of the territory of the United States, it would result in great financial benefit to the islands and their inhabitants and also to the United States; and all other nations would approve. Considering the interests of the Filipinos and the Americans both, it would be a grave mistake to sever the relations now existing between them.

There cannot be properly developed the immense natural resources of the country and the resulting business, with adequate facilities for conducting the same, without large amounts of capital, and it is impossible to secure these unless and until there shall be permanently established a government which is satisfactory and will not be assailed. If the United States should abandon the islands, capital already invested would be withdrawn, in part at least, and additional investments would be discontinued. The Americans in the Philippines who have done and are doing much to advance the pecuniary interests of the archipelago, as well as the natives themselves, understand and openly recognize the fatal results to the islands if they should lose our support.

During the last few decades, at least, China has not kept pace with others in the progressive march of nations. Possessed by nature with extraordinary opportunities, she has nevertheless been retroactive in disposition and, to some extent, has been exploited for the benefit of others. With a population of 400,000,000 and a territory almost as large as Russia, containing the richest and most productive soil, a variety of climate which permits the growth and maturity of the principal grains and fruits, and with an abundance of the richest minerals, she has, notwithstanding, become poor in cash resources; and the normal and necessary development of the country for the proper utilization of the national assets has been neglected, if not ignored. Consequently, in the consideration of questions relating to economic expansion, and in other respects, China has, for a long time, been well nigh helpless. It would not be useful, nor does time permit, to discuss the reasons for these conditions. Many of them are well known. It is sufficient to say that China, with her natural facilities, has the opportunity of becoming one of the greatest and most prosperous of nations.

Stable Government Needed

The present Chinese government is an honest, unselfish, capable, industrious and harmonious organization. There are statesmen in China of high intelligence and qualifications. It should be only a question of time when the internal strifes, that are prevalent and have done so much to obstruct and retard legitimate growth and prosperity, will have ceased; when the peoples of the different provinces will be pacified and possessed of a spirit of genuine loyalty and patiotism. This is what is especially needed in China, and this is what will be experienced when there is a clear and general understanding of the motives of those now in governmental control.

Apparently, the leading Chinese statesmen, the most intelligent and most influential citizens and the best thinkers are keenly alive to the situation and are earnestly solicitous for the immediate future of China. The present governmental administration and the parliament as well are devoting their talent and energy to ascertain and apply a solution for the problems which interfere with the growth and strength of their country. They realize that there is needed a new constitution which will establish a concentrated, unified, though democratic, government; a new and modern financial system which will be satisfactory to the financiers throughout the world; an adequate, thoroughly trained and fully equipped military force for defensive purposes; and the adoption of a systematic plan for the development of the whole country for the benefit and for the promotion of the welfare of the whole population. The leaders are frank and outspoken in declaring the desirability of a government such as I have indicated; and they appreciate also the necessity of having the friendship and assistance of all other nations. They know that, under these conditions and with this attitude on their part, and not otherwise, they may expect to establish a credit which will secure the loans necessary to reorganize the affairs of government, and will put to practical use the instrumentalities for providing the money which is now lacking.

One of the principal things needed in China is first-class railroads. We know by experience what they are and do for a new country. There are provinces with immense acreages of the most fertile soil and a population of scores of millions, that have no pretension of reasonable facilities for getting to purchasing or consuming markets. If there can be established the basis of credit as already suggested, and as now seems probable, it is to be hoped American capitalists will participate in further loans which will permit the rapid extension of railroad lines, for this will tend to correspondingly increase the volume of general business between the two countries. The people of China who are well posted are desirous of maintaining the most cordial and intimate relations with the business concerns of the United States. Formerly China desired to be left alone. She wanted to be exclusive and seculsive. She claimed to be self-contained, and really thought it was wise to live unto herself alone. That belief and attiture are becoming changed as a nation. She now wishes the open door policy to prevail. The national latch string is out for all other nations. Indeed, in some instances, those in authority have been too willing to grant concessions. Permanent concessions of territory at Shanghai, Peking, Kankow, Hongkong and other places have been granted to various foreign countries who still own and occupy the same. The United States was formerly included in the list, but I think we have released and abandoned all that were ever given to us.

The Chinaman is naturally strong, diligent, industrious, economical, honest and intelligent. He is a good farmer and a shrewd merchant. He would like to be a good and loyal citizen, and it is only because he has been imposed upon or has misunderstood the facts that he appears to have been at times unreasonable or disloyal.

He is a force in the world that must be considered, and it is wise to influence him honestly and practically in the right direction whenever the opportunity is afforded. Where Chinese blood is mixed with the Hawaiian or Filipino it has raised the standard of intelligent manhood, so far as I have observed.

The China of the Future

There are men who will live to see China a great and prosperous nation, rich, powerful and progressive; better than she ever was in her palmiest days; one of the best creditors of and debtors to other countries, and at peace with all the world. I hope and trust she is just now making a successful start in this direction. I have for her the same kindly feeling which so many of her best people undoubtedly entertain toward the United States. She will sometime have the power to do harm, but instead she may be a force for international peace, progress and prosperity.

Not Looking for War

I said repeatedly, on my own responsibility, making no claim except that I believed I could accurately represent public sentiment, that a large majority of the people of the United States did not desire, but would deplore and stubbornly oppose, war with Japan, except in self-defense, and that they were of the opinion there is not now nor will be any cause for serious trouble or disagreement; that there need be no conflict of opinion which could not be finally and satisfactorily settled by mutual negotiation and consideration. I also expressed the belief that our governmental administration is and would be inclined toward this most desirable exercise of authority. I would repeat and emphasize the sentiments thus expressed. Also I am here to say to you in words just as emphatic and in belief no less absolute that the leading and controling men of Japan are equally anxious to have a continuance, permanently, of the peaceable and friendly relations now existing between these two countries.

Japanese a Loyal People

Japan is a vigorous, progressive, prosperous nation. Representatives have temporarily resided in foreign countries, including England, Germany and the United States, for the purpose of studying the languages, customs, methods, improvements and facilities for advancement and for defense; and on their reports, from time to time, the Japanese people have adopted and assimilated what they consider to be the best features of enlightened civilization shown in the different countries. They are highly intelligent, determined, adaptable, very industrious and, above everything else, superbly loyal to their emperor and to their nation. The ordinary citizen lives for his country and is just as willing to die for it. There are no internal strifes; on the contrary, there is a harmonious whole. They present to the outside world a united front. This is as it ought to be in every nation. It gives a solidarity of power that is invincible.

It may therefore be seen why Japan has taken a leading position amongst the nations of the world, contrasting in a striking manner with her place 60 years ago. Rice is the principal, though not the only, crop grown in Japan. As the islands are mountainous and not fertile, it is probable at least 50 per cent is not cultivated. The fish industry is large and profitable. In farming, mining, manufacturing, merchandising and with respect to her schools, hospitals, courts, prisons, temples, means of transportation, military training and strength and, generally, in the possession of modern equipment and administration of public and private affairs, Japan excels, and already may be considered a model government in many particulars.

Japan has grown and is growing with her strength. She has, with Korea, Formosa and other island territory recently acquired, 259,671 square miles and a population of 72,000,000, as compared with 37,000,000 in 1872. Besides all this, she is now increasing in wealth and in the near future will, I believe, be considered rich, unless her present policy shall be abandoned. Her financiers, her business men and her statesmen deservedly rank high. They are farseeing and they are conservative. The wonderful natural beauties and artistic development and display, I cannot take time to describe.

I am disposed just now to discuss briefly before you questions which, as a business man, I was free to speak about in my intercourse with Japanese acquaintances. Because I was open and sincere and especially as I was an American, independent of any political obligation to consider questions of diplomacy, I met willing and attentive listeners and cordial greetings.

For some time there have been suggestions, in public and in private, in the United States and in Japan as well, that, for numerous reasons not necessary to recall, there was possibility, if not likelihood, of active hostility between these two countries. Whenever either government has decided to provide an additional warship some one in the other country has been prompt in charging that this meant preparation for war between these two nations.

I had good opportunity to ascertain the real situation, though my visit to Japan was comparatively short. The most prominent and influential men in Japan are outspoken in their profession of friendship for the United States and her citizens. They refer with sentiments of gratitude to Commodore Perry's visit in 1853, to them, apparently hostile at that time. They now consider this action as friendly and as the beginning of the growth of a great and prosperous nation. They speak of the benefit Japan has received and is receiving from the United States, educationally and otherwise. They claim to have received the largest benefit in economic lines by visits to and intercourse with Americans. They refer with satisfaction to the large increasing trade relations. And, without stopping to enumerate, they speak of our people as their friends and advisers, now and always, as fair and generous and pacificatory in policy and practice; as a model government, whose friendly interest they court.

A Good Samaritan

The United States was a good Samaritan. The splendid men who were duly appointed by our country, including both military and civil representatives, with fortitude and judgment and human instincts took up and carried on the work of renovating and rejuvenating the conglomerate of physical and moral corruption, which had developed without the fault or the understanding of the Filipino people themselves. The results of these efforts will stand for all time to come as a monument to the generous, humane and intelligent policy of an enlightened and unselfish nation, unless something shall be done in the future to counteract or neutralize the results of the course which has been pursued. All those who have represented the United States in bringing about the wonderful changes in the Philippine islands are entitled to the highest commendation. Their work has not been fully appreciated by the average citizen of this country.

Have Reasons for Peace

If you suggest these men may have dealt simply in diplomacy, so-called, or in diplomatic language, I answer, they gave me no reason to think so; I secured their confidence as I gave them mine. They do not hesitate to advance the reasons for peace and the objections to trouble. They realize that the geographical locations of these two countries should make them practically allies although acting independently and in their individual

capacities and interests. And, from the business standpoint, the Japanese manufacturers, merchants and financiers are desirous of co-operating with those in the United States, to the fullest extent, in protecting and promoting the welfare of both and at the same time benefiting those in other countries with whom both of us may be conducting business. They understand and appreciate the spirit of co-operation which has actuated the men engaged in our lines of business and they would be pleased to consider with us all legitimate plans for the application of this principle. While it is a difficult problem, requiring patience, skill and tact, still I believe we may be able to work out methods which will benefit all concerned. It is well worth trying. International conditions are peculiar. They are complicated and will be worse. Every one interested in international commerce should make careful survey of existing facts for purposes of future explorations and developments. There are many practical problems to consider and their solution will require time and thought; but we will find the Japanese business men ready to take them up in a fair, reasonable and intelligent manner.

What Japan Wishes in China

The subject of Japan's intentions toward China and her possessions is a mooted question in many foreign quarters. From considerable inquiry and study, I conclude Japan sincerely desires that China shall proceed and succeed in the directions I have indicated; that she shall become firmly established as a sound, peaceful, progressive, prosperous and rich government with free and open seaports, transacting an increasing business of every kind, within the limits of her capabilities, with any country or all countries outside her domains, on a fair, just and profitable basis. I am confident Japan would like China for a continuous, permanent, friendly, profitable and satisfied customer, with no political, social or financial difficulties, internal or international. I think we may expect to see, before long, efforts on the part of the Japanese people to cultivate cordial business relations with those in China. I know there are important and influential men in Japan who will actively advocate this course. I am also of the opinion, founded on conversations, that the Japanese will be glad to consult with Americans concerning financial, commercial and even political questions relating to China. Japan and China both wish for close and intimate relations with the United States and are willing to discuss and determine all matters affecting the rights and interests of any, with the purpose of doing justice to themselves and all other nations. The more our statesmen study these questions the more clearly it will appear there need be no irreconcilable differences of opinion.

Now, I would urge all, who find it practicable, to visit the Far East. Go during the autumn or early spring months, if convenient, but do not hesitate to make the journey during the summer. You owe it to yourselves, to the business interests you represent and to your country to come into close relations with the people of these far distant lands. While they are far away, if measured by miles, yet in point of time they are growing nearer, by reason of improvements in transportation; and the trip is enjoyable.

More and more of our business men should come into close contact with the people of Japan, China and the Philippines. It will be of benefit to all. There is much to see and to learn. Many misunderstandings have arisen and some still exist. They can and should be removed. It is as true as it is old that human nature is about the same the world over. We in the United States are not possessed of all the virtues. We are just as likely to be wrong in judgment and conclusion as others. Indeed, we have often been wrong. If some of our leaders in Congress had been better posted, it is possible that many ill-advised speeches would not have been delivered. At any rate, I strongly urge that as many of our citizens as find it possible take the time to personally and impartially inquire into the facts which bear upon the relations of the United States with other countries. There is always danger of unsettled disagreements if parties conduct their communications at arm's length. If they converse "eye to eye and face to face" even nations are much more likely to avoid conflict and to settle disputes without doing an injustice to any. If we are looking for trouble we can usually find it; and if we are looking for harmony it is, as a rule, equally easy to procure.

If any one connected with our government will spend a few months, or less time, in Japan, with an honest intention and effort to ascertain the sentiment of the large majority of the controlling elements, I verily believe such a one will be convinced Japan is not desirous of trouble with the United States, but, on the contrary, earnestly desires our friendship and co-operation in every worthy ambition.

After the War, What?

Efficiency Society Will Focus Discussions on Re-Adjustments Affecting United States

With "After the War—What?" the general topic, the Efficiency Society, which has completed arrangements for an open conference, to be held in New York City, Nov. 16, 17 and 18, will devote the entire meeting to constructive consideration of policies necessary to safeguard American industries under the changed conditions which will prevail when peace is declared.

At the 1916 conference leading representatives of financial, labor, manufacturing and marketing interests will give their conception of what will be the most important phases of our problem and what should be done to meet them by each element in our business life, so that the activities of each may be so adjusted as to promote the welfare of all.

The speakers will be broad-visioned men of practical experience, leaders in their groups, men drawn from the actual workers, students of their subjects, trained-in-business economists, men who have made good, men who will have responsible charge of doing what may be decided to be done.

Approval of the idea of the conference, and the program and the plans under way, and a desire to be present, have already been expressed by such men as Frank A. Vanderlip, president, National City Bank, New York, and chairman, American International Corporation; Henry R. Towne, chairman, Yale & Towne Mfg. Co.; L. H. Baekeland, naval consulting board; Henry T. Noyes, treasurer, German-American Button Co., Rochester; H. A. Wheeler, vice president, Union Trust Co., Chicago, and vice president of the chamber of commerce of the United States; Holden A. Evans, president, Baltimore Dry Dock & Ship Building Co.; William H. Eaton, treasurer, Eaton, Crane & Pike Co.; Wm. L. Lyall, president of the Brighton Mills, Passaic, N. J.; Melville W. Mix, president, Dodge Mfg. Co., Mishawaka, Indiana; Howard Elliott, president, New York, New Haven & Hartford railroad; Hamilton Holt, editor of *The Independent*, and others.

Will Make Flat Wire.—The American Steel Co., Park building, Pittsburgh, is adding a flat wire and a cold strip department for the manufacture of flat wire up to 1 inch in width and cold rolled strips up to 10 inches in width, at its plant at Ellwood City, Pa.

Testimonial Presented to Judge Gary

Handsome Gold Writing Set is Gift of All Members of American Iron and Steel Institute—Chas. M. Schwab Makes Presentation Speech at Meeting Held in St. Louis

STARS and stripes were gracefully entwined on the balcony in front of Judge Gary and numerous American flags covered the wall behind him. Six hundred and fifty men were standing singing "America." This scene, which marked the close of the dinner of the American Iron and Steel Institute at the Missouri Athletic Club, St. Louis, last Friday evening, had been preceded by the presentation to Judge Gary of a solid gold writing set, speeches by Charles M. Schwab and other leaders, and finally a short and intensely patriotic speech by Judge Gary.

Judge Gary, as president of the institute, presided at the dinner and introduced speakers as follows: George W. Simmons, vice president of the Simmons Hardware Co., St. Louis; William A. Rogers, senior member of Rogers, Brown & Co., Buffalo; E. F. Kearney, president of the Wabash railroad, St. Louis; George P. Early, special agent for the American Sheet & Tin Plate Co., and James H. Hoyt, Cleveland.

Mr. Schwab was next called upon and made an exceedingly happy address in which he spoke of the splendid record of Judge Gary, not only as the chairman of the United States Steel Corporation, but as a leader who had rendered inestimable service to all iron and steel manufacturers and to business in general. He said that Judge Gary had won the hearts, the confidence and the admiration of every member. Words could poorly express the feelings of the members of the institute. Mr. Schwab then presented to Judge Gary the gold testimonial consisting of a massive gold ink stand with two wells, a pen holder and a paper cutter. On the cap of one well were the initials "E. H. G." and on the other, the date, "1916". On the gold ink stand were inscribed the coat of arms of the institute and these words:

Presented to
ELBERT HENRY GARY, President,
by the members of the
AMERICAN IRON AND STEEL INSTITUTE
as an expression of their high regard
Saint Louis, Missouri, October 27, 1916

As Judge Gary arose, the guests stood and cheered him enthusiastically for several moments. When the enthusiasm had subsided, the judge said that he would not be candid if he failed to state that he had an intimation that something of a personal character—he did not know exactly what — would take place, and he was glad that this was true, for otherwise he certainly would not have been able to compose himself and give expression to his feelings. "Under these circumstances," said Judge Gary, "when your action touches my heart as it has tonight, I should not be able to trust myself without some preparation." Continuing, Judge Gary said:

"I am under obligations to you which can never be discharged. Indeed, it would be presumptious and ungrateful if I were to hint at such a possibility. I am proud beyond the measure of words to have, without exception so far as I know, the continuing friendship and confidence of the men representing the iron and steel industry in the United States and Canada. This constitutes a treasure of priceless value which is deposited in the deepest recesses of my heart, there to remain forever and ever. I would reciprocate fully if I could; but, alas, I cannot. I can and do return my highest respect and sincerest affection. And I express the hope that I may never give you any cause to lessen your esteem for me.

Dark Days of 1907

"In the autumn of 1907, the clouds of uncertainty loomed big and black on the business horizon. We were all more of less despondent and this feeling was not confined to our industry. The experiences of the past had been a forceful teacher. Leading men in financial and commercial circles implored those connected with the 'barometer of trade' to use their influence and efforts towards diverting and dissipating the impending financial typhoon.

"What we did, what followed, every one knows. It is history. We did what we could and the iron and steel men have been given and are entitled to much credit.

"Wide publicity was given to our proceedings. There were in attendance at our meetings, by invitation, representatives of all the trade newspapers, many of our regular purchasing customers, outsiders, more or less interested in the movement, including, at times, representatives from governmental departments. We also gave to the general press accurate accounts of our efforts and the same were likewise promptly reported to various department at Washington. Consequently we received considerable praise and very little and not any important criticism for what we were accomplishing. We did not wish nor intend to do anything that any responsible authority had criticised. If at any meeting or meetings held in other cities there was conversation which could be interpreted to be evidence of an improper design on the part of those participating, our answer is that, either the statements in question did not correctly represent the intentions of those who made them, or they did not, in any sense, indicate the views or the desires of those who were responsible for the general movement.

"I take this opportunity to emphasize the fact that no one directly connected with the 'Gary dinners', so-called, ever did or ever would do or say or approve anything concerning our business that is opposed to the spirit of the law or to the general public sentiment. If any one in our line of business has ever said or done anything which could properly be construed as a contradiction or modification of what I have said, then all of us deplore and disaprove.

"Now, what is this principle of cooperation? It is an honest, earnest effort to secure and maintain among business rivals a fair, healthy, vigorous competition and at the same time to oppose and to prevent an unfair, oppressive, cut-throat and destructive competition. It is calculated to establish on the one hand and to avoid on the other hand the very things so clearly and emphatically directed in the discussions of the Supreme Court of the United States. Summed up, it is described in the old expression: 'Live and Let Live.'

"In 1907 and the months following, our conservative, open, neighborly attitude no doubt acted as a stabilizer and aided in the prevention of sudden and extreme fluctuations that would have disorganized and demoralized business to the prejudice of large numbers of both employes and employers; and purchasers, with large stocks on hand, as well. We have an abundance of testimony to this effect from our customers. It also created and fixed in our minds the sentiment that rivals in trade may at all times be considerate and solicitous concerning each other. That there is something substantial in the idea of mutual confidence and regard, even in competitive business circles, we see abundance of proof on this occasion.

"On the 16th day of last August, I stood before the tomb of Confucius,

that ethical teacher and moral philosopher of 2,500 years ago, and I remembered his written words: 'What you do not like when done to yourself do not do to others,' which is a statement in negative form of the Golden Rule; and my mind instantly traveled over the space of nearly 10,000 miles to the homes and offices of a highly intelligent and loyal band of business friends who are represented here this evening, and to the principle and practice which animates your conduct. Better a thousand times over for the Chinese nation if the Chinese people, without exception, had adopted and always practiced the precepts of Confucius; better for us, in every respect, if, in our business intercourse, we and those connected with our enterprises had invariably followed this rule of conduct; better for the world at large, as now strikingly illustrated in Europe, if all the nations had maintained an attitude in harmony with the Golden Rule. I am not indulging in cant nor discussing questions of eternal salvation, although I believe the Golden Rule is the foundation of religion. Nor is it intended to exceed the bounds of practical application to our everyday business. We know by experience, if we but look into the depths of our hearts and then proclaim the whole truth, that when we refrain from doing anything affecting our business neighbors which we would like them to leave undone or unsaid about our business affairs, we are really advancing our own cause.

The Old Notion

"There is a principle involved in the subject of co-operation, private, public, national and international, which has become necessary to the highest success. The general sentiment throughout the world is opposed to the old notion that might makes right; that the stronger power is justified in crushing the weaker out of existence; that an individual or a collection of individuals, as long as the rules of law are observed, may ignore the rights of others. It is because of this fact that modern laws have been enacted to protect the weak. The old, hard business lines which were altogether selfish and arbitrary are giving way to the later methods which are considerate and fair. We have seen this in our business and we shall see more and more of it in the highest department of business activity. The iron and steel fraternity has been leader in the endeavor to make use of the idea of co-operation in everyday business life. It has established a prinsiple that will be permanent. As stated by our late and much beloved friend, Mr. Drummond: 'If Canada and abroad men hold * * * that the new basic principle has come to stay.' We have acquired a reputation for square dealing, for integrity of purpose, for generosity in practice and for friendly regard concerning the interests of others that is enviable and deserved. No one these days reproaches any of of us with double dealing, with cruel disregard of the claims of others or with destructive tendencies in regard to the business of another. The same could not truthfully be said of some of our predecessors. Conditions have changed; and you have helped to change them.

Must be Practical

"As a matter of course, we all realize the necessity of being practical. The ethics of business do not require us to neglect our customers or ourselves. We must get our fair share of the trade; but we are not required to misrepresent, to deceive our competitors, to go outside of our proper and natural spheres of operations, to suddenly and unreasonably change our prices in special places and on particular occasions or to resort to any of the old tricks of the trade which were intended to harass, demoralize and bankrupt our rivals. We can be practical and successful and at the same time fair, frank and gentlemanly towards our competitor.

"Just at this particular time the demand for our products exceeds the supply and it is not difficult to apply the principles referred to; but it is altogether probable we shall see a change to some extent, temporarily at least, after the war is ended. If so, there will be opportunity to fully consider our duty towards each other as business friends. We should do everything possible and proper to protect our business, our customers and our employes; to prevent demoralization. I sincerely hope to see all of you prosperous all the time.

"In times gone by, when disaster seemed possible, if not probable, we have been of real benefit to the business world and therefore to each other. Then it was that we discovered our neighbors were bigger and broader than we had supposed; in fact, that we ourselves were bigger and broader than we had believed. We have no excuse for doubt now. We know that each will do all he properly may to steady and stabilize business.

"It is probable the federal trade commission may be of much benefit to business men, depending upon the disposition of its members. So far as we have had opportunity to observe, this commission is favorable to business success. I would like to have its authority enlarged so as to permit it to advise in advance if inquiry should be made as to a contemplated action; but even under present conditions the commission should be of real service. I do not believe in governmental paternalism or management; but I do approve of governmental supervision and I favor patriotic, intelligent, generous operations by private individuals—in co-operation between officials and private interests.

"Let us hope and expect that not one of us will ever deviate from the true course of the co-operative movement, for it has cemented between us a feeling of cordial, sincere regard for each other; and it has been and will continue to be of substantial benefit to others whose welfare is affected by our decisions."

By request of Judge Gary, Mr. Schwab acted as toastmaster for the remainder of the evening and called upon a number of members, including Willis L. King, vice president of the Jones & Laughlin Steel Co., James A. Farrell, president United States Steel Corporation, Robert Hobson, vice president and general manager of the Steel Co. of Canada, and Cameron C. Smith, president of the Union Steel Casting Co., Pittsburgh, all of whom spoke in terms of the highest praise of Judge Gary.

Mr. Smith's speech was noteworthy on account of its great earnestness, and also because of the definite manner in which he described the service which Judge Gary had rendered to manufacturers outside the Steel Corporation. He said that a few years ago, when conditions in the steel casting business were decidedly unsatisfactory, the steel casting manufacturers were enabled, through an interview arranged by John A. Penton, to make plans for greatly improving business conditions and had successfully carried out these plans.

"Judge Gary," said Mr. Smith, "has done more to cleanse and purify business methods in this country than all the laws that congress has passed."

He described the harmonious relations of manufacturers today, contrasting them in a striking manner with the old feelings of hostility, the lack of which now is pronounced. So great, he says, is the confidence which now exists,

Mr. Schwab's Popularity

ONE of the most interesting features of the St. Louis meeting was the demonstration of the great popularity of Charles M. Schwab. Thursday, Mr. Schwab made a speech, under the auspices of the St. Louis Business Men's League, at the building of the Missouri Athletic Club. The throng was so great that the commodious quarters were overwhelmed. The number present was larger than that of the recent meetings of Mr. Hughes, or that of Secretary Baker, and at the same time that Mr. Schwab was speaking, Ex-President Taft was addressing an audience of moderate size. Mr. Schwab captivated St. Louis.

that when a man dies he is glad to have a competitor execute his will. In conclusion he said: "The next great step must be to bridge the infernal gulf between capital and labor, so that peace will reign between employers and employes, as it does today between competitors." Mr. Smith's remarks were greeted with enthusiastic applause.

Before surrendering the gavel to Judge Gary, Mr. Schwab, with a few gracious words of compliment and appreciation, proposed a toast to Mrs. Gary, who was seated in the gallery. As the guests rose and lifted their glasses, Mrs. Gary bowed in acknowledgment.

Before dismissing the guests, Judge Gary spoke very briefly. He said that last summer, when he and Mrs. Gary were traveling in Japan, they were most deeply impressed by the loyalty of the Japanese people to their government. Pointing to the stars and stripes which decorated the balcony before him, Judge Gary, with great depth of feeling and earnestness of words, urged the members to be true to their country and, no matter what happened, to be loyal to their flag.

As the judge took his seat, someone started singing America, in which the audience joined, thus most appropriately ending the program.

Friday Morning Session

The first meeting of the institute was called to order at 10 o'clock Friday morning by Judge Gary, who delivered his presidential address found elsewhere in this issue. His reference to the friendly feeling which exists in Japan toward the United States, his declaration in favor of holding the Philippines permanently as a part of this country and his advocacy of a protective tariff were greeted with much enthusiasm.

Judge Gary was followed by Clarence H. Howard, president of the Commonwealth Steel Co. and Business Men's League of St. Louis, and chairman of the local committee on arrangements for the institute, who spoke on St. Louis and Its Industries.

George P. Waterhouse, metallographist of the Lackawanna Steel Co., Buffalo, delivered a very valuable paper on the Duplex process of the Lackawanna Steel Co., which will be found elsewhere in this issue. This paper was briefly discussed, as were also the papers presented at the afternoon session. The papers of the afternoon were: Pulverized Coal as a Fuel for Metallurgical Furnaces, by James W. Fuller, president Fuller Engineering Co., Allentown, Pa.; The Iron Ores of the Adirondack Region, by Frank S. Witherbee, president Witherbee, Sherman & Co., Port Henry, N. Y.; Progress in Hot Blast Stove Design, by Arthur J. Boynton, superintendent of blast furnaces, National Tube Co., Lorain, O. Mr. Boynton, in his paper, said that there is at present no conclusive reason for advocating one type of stove over another. Recent developments may be said to have taken form to date in increase in capacity of units and the reduction in their number, together with the application of scientific methods to their operation. The practical result, he said, indicated a very remarkable improvement in furnace practice. Mr. Boynton's paper, which received much favorable attention, will be published in a later issue of *The Iron Trade Review*.

Saturday's Program

Saturday morning, three hundred members of the institute were taken by train to the plant of the Commonwealth Steel Co., Granite City, Ill., where the plant was thoroughly inspected and luncheon was served. Rousing cheers were given for Mr. Howard, who had been untiring and most successful in his efforts to contribute to the comfort and pleasure of all of the visitors during their sojourn in St. Louis. Mr. Howard's associates on the local committee were: Thomas R. Akin, August S. Busch, B. F. Bush, George C. Holmes, George W. Niedringhaus, A. L. Shapleigh and George W. Simmons.

After leaving the steel plant, the visitors were taken in automobiles on extended trips through the parks and suburbs, including a visit to the beautiful country home of A. A. Busch, on the old Grant farm. The weather throughout the two days was delightful and on the whole the St. Louis meeting was one which will rank high in the history of the institute.

The attendance was large, but not equal to that of the Cleveland meeting of October, 1915. Some of the most prominent members were absent on account of the many demands upon their time. One of the most conspicuous absentees was Joseph G. Butler Jr., of Youngstown. Mr. Butler arrived from France last Thursday, after spending two months abroad as a member of the American Industrial Commission. His report on iron and steel conditions in France will be found elsewhere in this issue. Mr. Butler sent a Marconigram to Judge Gary and members of the institute from the vessel en route to New York.

The Colt Patent Fire Arms Mfg. Co., Hartford, Conn., has closed a contract with a foreign government, the identity of which is withheld, for machine guns, amounting to $3,000,000. This brings the total amount of orders on the books of the company to $32,000,000, although constant deliveries are being made on large contracts.

Arthur C. Eastwood

President, Electric Controller & Mfg. Co., Died at Battle Creek, Oct. 17.

Arthur C. Eastwood, president, The Electric Controller & Mfg. Co., Cleveland, died Oct. 17, at Battle Creek, Mich. Mr. Eastwood was widely known as an electrical engineer and inventor. Shortly after graduation from college in 1898, he entered the electrical department of the Homestead Steel Works, and was associated with A. C. Dinkey in the first extensive applications of electrical power in the manufacture of steel. He left Homestead to accept a position as electrical engineer with the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala. While at the Ensley works of the Tennessee company his work attracted the attention of S. T. Wellman, and he came to Cleveland to accept a position as electrical engineer with the Wellman-Seaver Engineering Co. He was also appointed chief engineer of the newly formed Electric Controller & Supply Co. As a result of Mr. Eastwood's inventive ability, the growth of the latter company was so rapid that he was soon forced to give the business his entire attention under the title of general manager and chief engineer. About 1905 Mr. Eastwood and his associates reorganized the company, and the name was changed to The Electric Controller & Mfg. Co., with Mr. Eastwood as active head of both the financial and engineering phases of the business. Under his management the company has grown to its present large proportions.

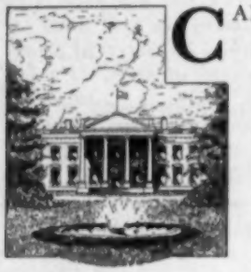
Mr. Eastwood was the patentee of nearly 100 inventions, covering all phases of electrical control and power generation. His greatest pride, however, was the lifting magnet, the perfection of which has saved the steel industry many million dollars. His inventive ability, however, was probably one of the less important factors in his success. His personality was of such a winning nature that he was enabled to build up an organization of devoted and loyal assistants, and his character was so strong and yet so fine that all who knew him, honored him.

William K. Milholland, president of the W. K. Milholland Machine Co., Indianapolis, died recently following an operation. Mr. Milholland was 60 years old. He was born in Baltimore and came to Indianapolis to establish a machine company in 1906. He was a charter member of the American Society of Mechanical Engineers. He is survived by a widow and seven sons.

Business News of Nation's Capital

Bids on Four Battle Ships and Twenty Torpedo Boat Destroyers Reflect Conditions as to Labor and Materials Which Will Delay Construction

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Oct. 31, 1916.



CAREFUL consideration is being given by the navy department to bids opened last Wednesday for four battleships and 20 torpedo boat destroyers. It is desired to make the awards as quickly as possible in order that work of constructing the vessels may be taken up with all possible expedition. Extraordinary conditions surrounding the labor and material markets were reflected in all of the bids. In every case, battleship bids were made conditional because of the unusual industrial situation, and the same was true with regard to most of the destroyer bids. The proposals, therefore, are exceptionally complicated and it will require much study before awards can be made, although department officials expressed the hope that this could be done the present week. The bids are the first to be opened for an important portion of the new naval program and involve an unprecedented amount of tonnage. Figures for the battleships were submitted by the New York Ship Building Co., Camden, N. J.; the Fore River Ship Building Corporation, Quincy, Mass., and the Newport News Ship Building & Dry Dock Co., Newport News, Va. The William Cramp & Sons Ship & Engine Building Co., Philadelphia, made no formal bid owing to abnormal conditions of the labor and material market, but offered to build one battleship on a cost and commission basis. It was proposed that the government pay all expenses in connection with construction work, including overhead charges, and allow the company an additional 10 per cent commission. It is said this offer could not be legally accepted for the battleships, but a proposal of a similar nature could be accepted for the four battle cruisers, for which bids will be opened on Dec. 6.

While all of the ship building yards are rushed with work, they showed by their efforts that they had reserved special space for the government work to aid it in executing its preparedness program. In other respects also they showed a desire for cordial co-operation with the government both by way of affording room in their congested yards for its program, and by submitting figures which are much lower than they receive for merchant ship building.

The deliveries proposed are somewhat extended, as a matter of course, when compared with deliveries made in normal times, and this feature of the case has been deplored by the navy department, but it appreciates the situation and realizes that the private yards will exert their greatest efforts to deliver the ships as quickly as they can. No navy yards offered figures for the battleships.

Proposed deliveries of battleships vary from a minimum period of 39 months, named by the Newport News Ship Building Co., to a range of from 40 to 48 months by the Fore River Ship Building Co. It therefore is improbable that private builders can take advantage of the bonus offered in the naval act for expeditious construction. "Expeditious construction" is said to have called for delivery within 36 months or less time.

Bids for battleships ranged from $10,060,000 to $11,475,000, both included in proposals of the Fore River company, as against the department's limit for hull and machinery of $11,500,000. The labor and material markets prompted congress to increase the limit $3,000,000 over that of last year. On the face of the bids, it is thought the Fore River company and the Newport News company will get two ships each, although the New York company may get one. As has been indicated, however, awards will depend upon the conditions proposed rather than upon the actual figures submitted. Delivery in all cases is to be made at the yards.

Twenty-four offers for construction of the 20 destroyers were made. The limit of cost is fixed at $1,200,000, a big increase over previous limits. Bids ranged from $1,150,000 each for four vessels, offered by the Bath Iron Works, Bath, Me., to $1,386,000 offered by the Seattle Construction & Dry Dock Co., Seattle, Wash. Other bidders, who put in intermediate figures were the Union Iron Works, San Francisco; the Cramp company and the Fore River company, which proposed to build from four to eight vessels, the latter being the highest number any single company offered to build. It is probable destroyer bids will be divided among most, if not all, of those submitting figures on them. The time of deliveries ranges from 22 to 28 months.

The navy department will open bids tomorrow for four scout cruisers and 45,583 tons of armor plate. These scout cruisers will require about 20,000 tons of structural steel.

Bids on Guns

Washington, Oct. 31.—Awards may be made this week by the bureau of ordnance of the navy department for 40 16-inch guns, and by the bureau of ordance of the war department for two 16-inch guns. Bids on these guns were opened last week and were submitted by the Bethlehem Steel Co., and the Midvale Steel & Ordnance Co. The guns for the navy department are to be mounted on the four battleships authorized by the new naval act for the current fiscal year, each ship to carry eight guns of this type, leaving a reserve of eight. The guns for the war department are to be used for coast fortifications, and will be somewhat longer than the naval guns.

For 20 of the guns for the navy department, the Midvale company bid $174,000 each, the first gun to be delivered in 23 months, and the remainder within 43 months. The Bethlehem company bid on 22 guns for the navy department at $176,100 each, the first gun to be delivered in 21 months and the remainder to be completed in 43 months.

On the two guns for the war department, the Bethlehem company bid $225,000 each with breech mechanism according to the department design, and $215,000 each without breech mechanism. For the Bethlehem design with breech mechanism, the bid was $220,000 each, and without breech mechanism the figure was $205,000 each. Delivery of the first gun would be made in 30 months, and of the second gun in 36 months. The Midvale company, bidding exclusively on its own design, put in a figure of $209,000 for each of the two guns, without breech mechanism, and $220,-

000 each with breech mechanism. Delivery of the first gun would be made in 38 months and of the second gun in 42 months.

Only one 16-inch gun has ever been built in this country and it was constructed at the Washington navy yard. This type marks a new and greater caliber for the United States navy, and construction of the guns by the Midvale and Bethlehem companies will call for specially equipped plants with tremendous lathes, which will be of the 60-foot type, it is understood. Because these new machine tools will first have to be made and plants equipped for the construction of the guns, the delivery periods were necessarily extended.

Car Shortage

Washington, Oct. 31.—The interstate commerce commission is to make a thorough investigation of the shortage of cars on railroads of the entire country. The first informal conference for this purpose will be held by Commissioner McChord at Louisville, Ky., on Nov. 3 and 4. Representatives of all southern carriers, including those reaching the gulf and of the eastern carriers, including those reaching the seaboard, will attend and explain present car distribution, delays in movement and unloading, etc.

The commission has also announced that, beginning with Oct. 15, last, all of the larger carriers of the country will be required to file semi-monthly reports of freight car requirements and supply. In addition these same carriers will be required to file quarterly reports on car shortage as of the first of January, April, July and October.

Plant is Enlarged

Six new buildings designed to quadruple the capacity of the Cyclops Steel Co., Titusville, Pa., are being erected. The present plant employs about 100 men in the manufacture of tool steel.

The Cyclops company was founded 30 years ago by Charles Burgess. Last March, Mr. Burgess sold the controlling interest to Carl F. Boker & Sons, New York. Day & Zimmerman, Philadelphia, are supervising the construction of the additions.

The improvements will include a 10-inch bar mill housed in a 75 x 110-foot building; a new blacksmith and treating shop, 60 x 80 feet; a machine shop, 40 x 70 feet; a puddling mill with furnaces in a building 60 x 130 feet; and a chemical laboratory. Specifications for the laboratory have not yet been drawn.

The new buildings are to be entirely fireproof, with structural steel frames and steel siding. Construction is being rushed with expectation of completion by Jan. 1, 1917.

No Americans

Will be Welcomed Unless They Have Canadian Branches.

Toronto, Oct. 31.—The exhibition of goods of German and Austrian manufacture, which, after being shown in many English cities was brought out to Canada where it has already been shown in Montreal, was opened in the Convocation hall, Toronto university buildings, Oct. 23, with H. B. Kershaw, of the department of trade and commerce in charge. The most important feature is the display of hardware, including many articles formerly marketed in Canada for which there is considerable demand. The cutlery shown is generally very cheap and of poor quality. The exhibition has attracted many manufacturers from all parts of Ontario, some of whom, after a critical examination of the hardware lines, state that they will be able to produce some of them at a profit and meet the German prices.

Contrary to announcement in the Toronto press that "any manufacturer" would be welcome to attend and bring expert workmen, admission is strictly limited to Canadians. American manufacturers will not be admitted unless they have branch establishments in Canada.

Anti-Unionism Pamphlet

A pamphlet aiming to set forth the disadvantages of closed shop unionism, for distribution among workmen, has been issued by the Employers' Association of Pittsburgh. It is described by Wm. Frew Long, manager of the association, as an argument presenting to the workman the personal disadvantages of membership in a closed shop union, and to counteract, in some measure, the work of union organizers and union literature. Its language is elementary, direct and to the point, from the viewpoint of the employer opposed to unionism.

New Plant Addition.—Architect W. S. Ferguson, 1900 Euclid Avenue building, Cleveland, recently awarded to the Penn Bridge Co. the contract for the plant addition to the Atlas Car & Mfg. Co. This building is 162 x 219 feet, one and two-story, and is expected to cost $60,000. It is estimated that 200 tons of steel will be required.

Benzol Contracts

Are Being More Freely Made—Wide Spread in Toluol.

New York, Oct. 31.—Contracting for pure benzol for the calendar year of 1917, has been considerable and the price has been 60 cents per gallon, according to leading sellers. A feeling is current in the benzol trade that a weaker market for 1917 is likely because the large contracts which featured the buying for this year are not coming forward. Authorities in the selling trade, however, point out that the volume of unshipped business to be carried over into 1917 will be large and new contracts already have been taken in sufficient number to absorb a considerable proportion of the amount available for 1917. They believe that the forward market is stronger than surface evidences indicate. Spot benzol is in good demand and numerous orders continue to be satisfied by offerings from second hands. The market is quoted from 60 to 65 cents, depending on the quantity. Phenol is strong with an active inquiry. The market shows the effect of recent heavy sales, mainly for export. Spot is quoted at 55 cents, per pound, but this price has been shaded.

Toluol shows a wide price spread. Some sellers ask $3, per gallon, for spot, but $2.25 has been done and lower is reported. The contract market is uncertain, but is following closely the spot prices. Buying is moderate. Manufacturers of color and color intermediates now are buying derivatives from toluol, such as toluidin whereas in the past they have taken principally aniline oils from benzol. Solvent naptha remains weak with prices from 25 to 30 cents, per gallon, on both spot and contract.

Continuing demand for sulphate of ammonia for nearby exceeds the supply and rising prices are maintained. The past week saw them advance to $3.85 and $3.87, per 100 pounds, at tidewater. Producers are unable to take on sizable orders this side of May.

Market Prices for Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.	
Pure benzol	$0.60 to .65
Toluol	2.25 to 3.00
Solvent naphtha	.25 to .30
Per Pound at Producers Plant.	
Phenol	.55
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$3.85 to 3.87

Contract.

Per Gallon at Producers Plant.	
Pure benzol	$0.60
Toluol	2.00 to 2.50
Solvent naphtha	.25 to .30
Per Pound at Producers Plant.	
Phenol (nominal)	$0.55 to .60
Per 100 Pounds at Seaboard.	
Sulphate of ammonia (nearby)	$3.85 to 3.87

William I. Ballentine has become identified with the Chain Belt Co., Milwaukee.

United States Must Make Choice

As to Whether it Will Trade With the Entente Allies or the Central Powers After the Great War—Joseph G. Butler Jr. Submits Report on Iron and Steel Conditions in Europe

THE American Industrial Commission to France, which sailed for Bordeaux Aug. 26, has returned to the United States and Joseph G. Butler Jr., Youngstown, O., has submitted the following report on iron and steel to W. W. Nichols, assistant chairman of the Allis-Chalmers Mfg. Co., Inc., and chairman of the commission:

In accordance with your request, I beg to submit the following report, which is the result of observations and information obtained, regarding the particular industry represented by me. Quite unfortunately, there were only a few visits to steel plants of any importance, and the information gained is rather superficial.

I noticed a dearth of labor-saving devices, and quite prominently the absence of safety appliances. I also observed that notices to the employes calling attention to probable dangers, were not as plentiful as in any model plant in the United States. It is probable that there are many plants in France that are more up-to-date than those we visited.

I have information in regard to the condition of the iron and steel business in France at the outbreak of the war, but we are only concerned in its present and probable future condition when the war is ended.

Germany, at the close of the so-called Franco-Prussian war took over the tremendous fields of iron ore and coal located in Alsace-Lorraine. As a matter of fact, it is my belief that this absorption is largely responsible for the prosperous condition of the iron and steel business in Germany, and its being in second place in the world's production. I am assured by men prominent in the iron and steel business in France, and by others connected with the government, that the war will not end until these valuable mineral deposits have been restored to France. It is remarkable that with this serious handicap, France has been able to accomplish so much in the way of steel supplies for its munition plants, and other plants making war material accessories.

It seems from my observations that nearly all the iron and steel now produced in France is being turned into war material, and that these materials required for other purposes have been furnished in a minimum and scanty way. In other words, the whole of the iron and steel interests in France, has been mobilized by the French government. The last report I have seen on steel and iron production in France is dated May, 1915, but I am told on good authority that since that date the production has been doubled.

Shortage of Coal

With the reacquisition of the Alsace-Lorraine iron and coal deposits, and possibly the acquirement of other fields which our French friends seem to have in mind, there will still be a shortage of coal. However, it is expected that after the war closes, France will necessarily be obliged to export a good portion of its production of iron and steel, by reason of the increased productive capacity of its iron and steel plants.

Incidentally I might mention that, when we were in Marseilles, my attention was called by the chamber of commerce to the fact that France would be in a condition to export large quantities of iron ore from Algeria to the United States, and if this project could be worked out, and return cargoes of American coal brought to France, it would be very desirable, and meet the shortage of coal, which is inevitable. The analysis of this Algerian ore shows the quality to be such as would produce high grade steel materials. A detailed analysis will be furnished to anyone who may be interested.

It is interesting to note that in the departments of Calvados, Manche and Orne, there are rich deposits of iron ore yielding in some cases 45 to 50 per cent metallic iron. These deposits before the war were leased by the Thysen group of German steel manufacturers, but are now in the hands of the French Sequestrators. I understand that quantities of this ore also were in great demand, and frequently shipped to the iron works of South Wales.

Electrical Process

I examined the steel plant making steel by the electrical process, but the examination was very brief. I have assurance, however, that the manufacture of steel by electricity in France has been very successful, not only mechanically but financially, and is sure to grow. There seems to be a large area in the eastern part of France, where water power is available, and I think that many new plants and much activity will prevail in this particular region, when affairs again become settled. The use of water power will, to a large extent, overcome the shortage of coal. I think that when the war ends, the imports to France from the United States of iron and steel, will be confined to special forms, and that France will be able to compete not only with the United States, but also with other countries, in the matter of exports of general iron and steel products.

With the port improvements contemplated at Bordeaux and Marseilles, world-wide markets will be opened for France. The contemplated improvements at both these places will, no doubt, be fully cared for in other special reports, or perhaps in the general body of the report which the commission may issue. The canal at Marseilles should receive special mention in the general report.

The tariff question in France is in about the same condition as in the United States, with the exception that in France, customs duties are handled quickly and settled expeditiously by the government. Duties may be raised or lowered over night to meet contingencies.

Increased Production

In spite of the fact that at the beginning of trench warfare, France had lost behind the German line 80 per cent of her normal pig iron production, and 70 per cent of her steel production, it has been possible by the utilization of lower grade ore in other districts of France, and which were not exploited to any extent previously, to increase the steel production of the country 100 per cent in the last year. The plants in the center and southern part of France, were already producing the special qualities of steel required for artillery use, hence the amount of special quality steel brought in from foreign countries, in both the raw and semi-manufactured state, was an immediate necessity for the country at the outbreak of hostilities. It is also noticeable, and based on information obtained from leading steel manufacturers, that many idle, and in some cases abandoned plants, have been rehabilitated and utilized as far as possible. As a matter of fact, I am told that there is not a single idle plant of any kind, formerly engaged in the manufacture or fabrication of steel, that is not now in full operation, either in its original form, or by being transformed into a munition plant.

It is only too evident that the present pre-occupation of steel manufacturers is to bend every effort to assist in the final military victory of the allies. However, I met steel manufacturers, conversing with them freely, and their mental attitude is that when the military victory has been achieved, and France has again entered into possession of her own, they are determined to succeed in producing a close union with the British producers, and thus prevent a rapid return of German industrial prosperity. With this fact in mind, it seems clear to me that the United States will have to make up its mind in which field it will choose to work. It certainly will be impossible to continue to hold a position of theoretical neutrality.

Welfare work in Le Creusot is in a high state of efficiency. Comfortable modern dwellings are furnished the employes at low rental. Hospital facilities are of the best, and everything is done to bring the workman in close and harmonious relations with his employer.

It has been suggested that I embody in this report something with reference to the mines in France, but as the data concerning this have been printed in public documents of the French minister of mines, I will omit this detail with the single word that these reports include minerals of all kinds.

I am indebted to John Weare, representative of the United States Steel Products Co., in France, for valuable information, in the preparation of this brief report.

Iron and Money: Fact and Comment

New York Bankers Reorganize Another Ohio Steel Company—New British Loan Arranged—Steel Stocks Gradually Attain Higher Levels

ANOTHER Ohio steel company has been reorganized through the assistance of the New York syndicate comprised of Dominick & Dominick, Hornblower & Weeks and Kinnicutt & Co. These are the same bankers who recently organized the United Alloy Steel Corporation, Canton, O., to take over the United Steel Co. Their latest undertaking is the Transue & Williams Co., Alliance, drop forging manufacturer. Control of this company last Friday passed to a new company, called the Transue & Williams Steel Forging Corporation, which has a capital of 110,000 shares of no par value.

Of the new stock, 100,000 shares will be issued and 10,000 shares will remain in the treasury. A sum of $750,000 cash will be paid into the new company by the bankers. Interests connected with the old company have purchased 30,000 shares of the new stock and the remaining 70,000 shares is being marketed. The plant of the Transue & Williams Co. has an annual forging capacity of over 40,000 tons, and a stamping capacity of over 4,000 tons. The company has made a specialty of alloyed steel forgings and is the largest manufacturer of this kind. Its principal customers at present are the automobile manufacturers. It is announced that its operations probably will continue to be largely in the field of alloy steels.

The company was established in 1898 and has had a very successful career. Its capital has been $700,000. In 1915, its sales and net earnings, respectively, have been $3,841,321 and $671,251 and in 1916 (seven months), $3,329,772 and $648,026. The unfilled orders Sept. 6, 1916, were $3,212,068. O. F. Transue, vice president and general manager of the former company, will be president, and F. E. Dussel, secretary and treasurer, of the new corporation. The directors will include Frank Transue and representatives of the bankers.

The final negotiation of the latest British loan is considered the most important financial development of the past week. The significance of this $300,000,000 credit is that American bankers urged that it be arranged at this time because of the superabundance of funds which are not being employed. That it will be followed by another before long is assured by the recent official announcement in the British parliament that "England must find $10,000,000 a day to pay for its purchases in America." At that rate the new loan will last a month.

The stock market has been somewhat subdued with the approach of election day, professional traders supplying the bulk of activity. Notwithstanding this condition, steel stocks have gradually ascended to levels close to their record high water marks. United States Steel common, in fact, put this mark up a notch last week, selling for a time at a higher price than the preferred shares of the Corporation, for the first time in history.

Quotations on a number of iron and steel and industrial stocks at the close of the New York stock exchange Oct. 28, and net changes for the preceding week are shown in the following table:

	Close Oct. 28.	Net change.
American Can	62⅞	+2⅛
American Can, prfd.	113⅜	— ⅛
Amer. Car & Fdy.	67⅜	—1¼
American Locomotive	82⅜	— ⅛
American Locomotive, prfd.	107	+ ½
American Steel Foundries	62⅝	+ ⅜
Baldwin Locomotive	83½	—2
Baldwin Locomotive, prfd.	106½	—1½
Bethlehem Steel	650	+100
Bethlehem Steel, prfd.	150	+ 17
Colorado Fuel & Iron	53¾	—1¾
Continental Can	103	.....
Crucible Steel	87⅝	+ ⅛
Crucible Steel, prfd.	122	—1
Gulf States Steel	96	+1
Gulf States Steel, 1st prfd.	100	+1
Gulf States Steel, 2d prfd.	95½	+1
Internat'l Harv. of N. J.	118	—1
Internat'l Harv. Corp.	78	—2
Lackawanna Steel	89⅛	+3
Nat'l Enamel'g & Stamp. Co.	28⅛	— ⅞
Nat'l Enam. & S. Co., prfd.	95½	+ ½
Pressed Steel Car	72	+1⅛
Pressed Steel Car, prfd.	105	+1
Pullman Palace Car	170½	— ⅜
Republic Iron & Steel	77⅜	+1⅛
Republic Iron & Steel, prfd.	113½	+1½
U. S. Cast Iron Pipe & Fdy.	26¼	+1
U. S. C. I. P. & Fdy., prfd.	63⅜	+5⅜
United States Steel	118½	—1
United States Steel, prfd.	121⅜	— ⅛
Westinghouse Mfg. Co.	63⅞	+ ½

Maximum quotations for a number of leading iron and steel securities not listed on the New York stock exchange as of Oct. 27 and Oct. 20, compare as follows:

	Oct. 27	Oct. 20
American Radiator	415	400½
American Ship Building	60⅜	58½
Cambria Steel	135	145
Chicago Pneumatic Tool	73¾	73
LaBelle Iron Works	77	77½
Lake Superior Corp'n	15⅛	14⅜
Stewart-Warner Speed. Co.	114½	116
Warwick Iron & Steel	9¾	9¼
Westinghouse Air Brake	158	159
Westinghouse Elec & Mfg. Co.	65	64⅛

Financial Crop Ends

Dilworth, Porter & Co., Inc., Pittsburgh, manufacturers of tie plates and spikes, advises that their capital, originally $20,000, has been increased to $2,000,000. On Nov. 1 this corporation will take over all the properties and affairs of Dilworth, Porter & Co., Ltd., which is capitalized at $2,000,000. The shareholders, management, organization and capitalization of the incorporated company will remain the same as that of the limited company. In other words, Treasurer F. C. Stoeltzing states, the company is changing its form from a limited co-partnership association to an incorporated stock company.

* * *

Stockholders of the Federal Radiator Co., New Castle, Pa., will be asked to authorize an increase in the company's capital stock from $600,000 to $1,000,000. Of the increase, $200,000 will be common stock and $200,000 will be 7 per cent preferred. The funds provided will be used for extensions to the company's plant.

* * *

All of the $1,500,000 first preferred 8 per cent cumulative and convertible stock of the Spicer Mfg. Corporation has been sold. Merrill, Lynch & Co. and Cassatt & Co. are offering a limited amount of common at $47 a share, subject to allotment. The company was formed to take over the business of the Spicer Mfg. Co., with plants at South Plainfield, N. J., the largest manufacturer of universal shafts and joints for automobiles and motor trucks in the country.

* * *

The Michigan Stamping Co., Detroit, has increased its authorized capital stock from $30,000 to $1,500,000 and has declared a 233 1/3 per cent stock dividend. This is the second stock dividend this year, 25 per cent having been paid in February. It is understood that $1,300,000 will be in common stock which will sell at $12 a share and $200,000 will be in preferred stock. The company states that $1,750,000 worth of business is assured for the year 1916 and contracts have been closed which assure a business of at least $3,000,000 in 1917.

* * *

Edward A. Langenbach, former president of the United Steel Co., Canton, O., has been elected chairman of the new United Alloy Steel Corporation; H. R. Jones, vice president; E. D. Rogers, vice president, and E. L. Hang, secretary and treasurer. The directors include E. H. Wooding, president of the American Car & Foundry Co.; E. H. Wells, president of the Babcock & Wilcox Co.; Harry Coulby, of Pickands, Mather & Co.; Bayard Dominick, of Dominick & Dominick, New York; and John W. Prentiss, of Hornblower & Weeks, New York.

* * *

The Pressed Steel Car Co., Pittsburgh, yesterday declared a quarterly dividend of $1.50 a share on its common stock in addition to the regular quarterly dividend of $1.75 on the preferred stock. The common disbursement represents an increase of 50 cents a share over the payments when dividends were resumed in September, this year. The common paid nothing in 1915, 3 per cent in 1911, nothing from 1905 to 1913, inclusive, 3 per cent in 1904, 5 per cent in 1903, 1902 and 1901 and 6 per cent in 1900.

Millions Spent in a Runaway Market

Ordnance Builders Place Mammoth Contracts While Ship Yards Besiege Tool Makers for Equipment—Railroads Come to Life After a Lull and Place Extensive Orders—Crane Market Flooded

THE volume of business in the machine tool market again is assuming staggering proportions. Most of the requirements now being placed are coming from concerns which are sharing or expect to share in the work to be distributed by the government in connection with the huge naval construction program. A large volume of business is coming out from ship builders throughout the country and, in addition, small orders from diversified sources have increased. Even the foreign demand for machine tools, although not active, is better than a month ago. The biggest business during the past week is comprised in the purchases of the Bethlehem Steel Co. and the Midvale Steel & Ordnance Co. The latter concern bought four gun lathes, each 160 feet long, and having capacity for machining the heaviest caliber guns built. In addition, this company bought a large number of heavy-duty lathes, rifling machines, its total purchases involving an aggregate expenditure of about $500,000 to $600,000. The Bethlehem Steel Co. placed orders for machine tools involving a total expenditure of approximately $1,000,000. Its purchases included a large number of heavy-duty lathes, rifling machines, etc., and nine gun lathes similar to those placed by the Midvale company. The gun lathes for the Bethlehem company, however, will not be made by the regular builders, but will be produced at the plant of a leading eastern maker of heavy machinery under a special arrangement. The Bethlehem company adopted this policy due to the fact that it was impossible to secure satisfactory deliveries from the regular sources. During the week the Niles-Bement-Pond Co. submitted bids on two of these lathes, 160 feet long, and capable of machining the heaviest caliber guns.

Prospects of Good Business from Ship Builders

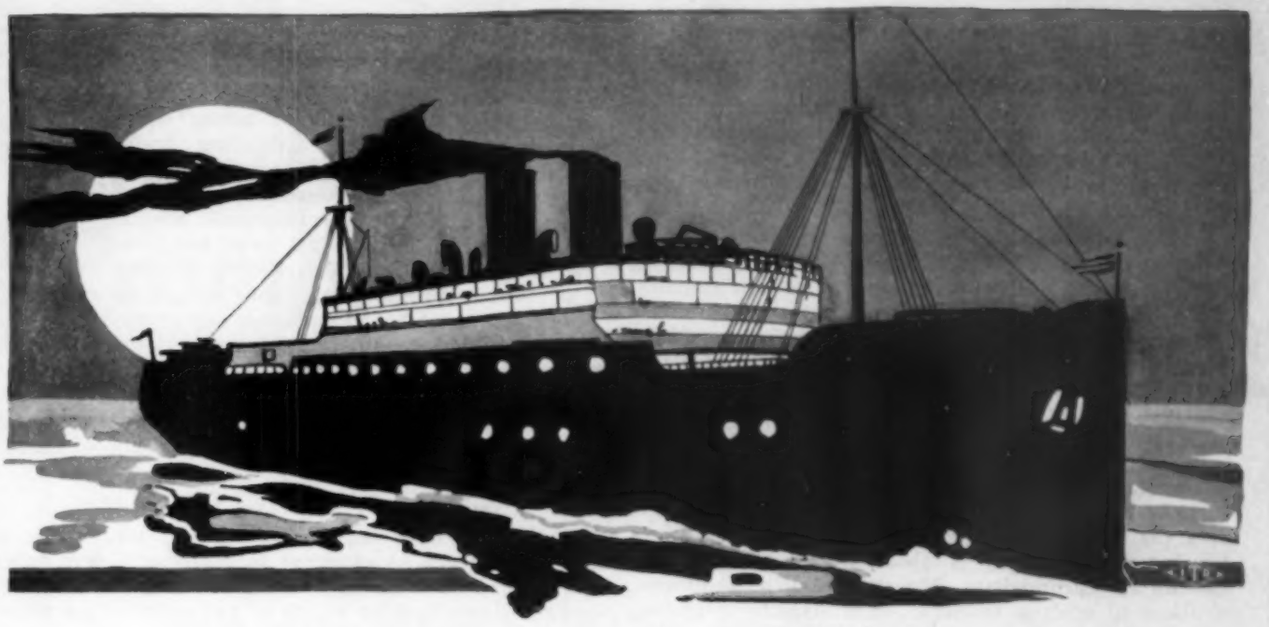
A huge business from the ship building industry is in prospect and it is believed that a great deal of this will be closed without much delay. The largest prospective buyer of this type of equipment is a concern which now is being organized to build a big ship yard in Seattle. Two representatives of this concern now are in New York and are expected to place a huge list of the required machine tool equipment as soon as they have sounded the different makers on deliveries. Another large prospective buyer is the Standard Ship Building Corporation, 44 Whitehall street, New York, whose plant is on Shooters Island, N. Y. This company has put out a list of equipment involving an outlay of fully $1,000,000. The Texas Steamship Co., Bath, Me., which has been a large buyer of late, is expected to come into the market for large additional requirements, since its revised program involves a larger plant than originally was contemplated. Another ship building company now being organized to build a plant at Portland, Ore., is in the market with a large list.

Many Industries Besieging the Tool Market

The Driggs-Seabury Ordnance Co., Sharon, Pa., has placed orders for a large number of machine tools for use in gun work, and this company now is understood to be in the market for large requirements of a similar character. A large amount of machinery, including a number of complete sets of car building equipment, has been purchased by a number of the leading concerns in this line. These include the Standard Steel Car Co., the Middletown Car Co., the South Baltimore Car & Foundry Co., and the Pressed Steel Car Co. The Washington Steel & Ordnance Co., Washington, has bought a large amount of equipment for shell work and gun forgings, and it still is in the market. The General Electric Co. continues to add to its pending inquiries; these involve heavy requirements of the usual character for its Fort Wayne, Ind., and Schenectady, N. Y., plants, and for the large new plant which the company is to build in Bloomfield, N. J. The Nathan Mfg. Co., New York, again has entered the market for considerable equipment for making time fuses. Demand from the railroads has improved. The Pennsylvania Lines West have taken bids on about $75,000 worth of machine tools. The New York, New Haven & Hartford has put out a good-sized list involving several heavy tools. The Southern railroad also has put out a list involving small tools principally. The Southern Pacific, Union Pacific, and the Santa Fe are placing good-sized requirements involved in lists previously issued. A large buyer of tools during the week was the Illinois Steel Co., which bought complete machine shop equipment involving an expenditure of about $100,000. Export business now is coming principally from Italy, France and Russia. While the foreign demand is not especially active, it is larger than a month ago. The matter of deliveries has undergone no radical change, excepting that nearly all heavy machines are moving farther off into the future. One large maker reports that excepting one or two special railroad tools, deliveries on practically all lines, including heavy lathes, planers, etc., are not obtainable in less than eight or nine months. Other makers of heavy machine shop equipment are in a somewhat better position, but on the whole, deliveries of heavy tools do not show any tendency to decrease. Lathes of 20-inch and smaller swing, as previously reported, are easy to obtain. Radial drills, in some cases, can be had in six to eight weeks.

Deferred Deliveries Hamper Crane Market

The crane market continues to move along rapidly. The distant deliveries which are quoted have slackened the buying to a certain degree. Cranes already have been sold for delivery in the early part of 1918. The largest crane business reported is an order from the Bethlehem Steel Co., and divided between the Morgan Engineering Co., Alliance, O., and the Alliance Machine Co., Alliance, O., for 30 cranes for installation at the Sparrows Point, Md., plant. These cranes include all sizes, from a 175-ton ladle crane, to 5-ton travelers and chargers. The Bethlehem company is in the market for a number of cranes for installation at South Bethlehem, Pa. Bids on two large cranes for the Watertown arsenal will be opened Nov. 3. These cranes will serve the shrinkage pits in the gun shop and each is to have capacity



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of 171 tons. Alternate bids also will be received on two 217.5-ton cranes. The Ray Hercules Copper Co. has placed an order for a mine hoist, the Utah Copper Co. for a 50-ton traveler, and the Baltimore Smelting & Refining Co. an order for a charging machine. The Utah Copper Co. also placed an order for an ore bridge, which went to the Mead-Morrison Mfg. Co., Boston.

The Germantown Tool Works, Philadelphia, is about to extend its plant. Edwin A. Moore, Reading, Pa., is erecting an addition to his gray iron foundry. The General Electric Co. plans to erect a steel foundry and a manufacturing extension at West Lynn, Mass. The Abrasive Co., Philadelphia, will erect a large 3-story addition. The Philadelphia Enamel Mfg. Co., Philadelphia, will build a large addition. J. C. McElroy, Thirtieth and Chestnut streets, Philadelphia, will erect a good-sized foundry. The Auto Radiator & Fender Co., Baltimore, will add to its plant. The Norfolk & Western railroad contemplates the erection of a car shop addition at Roanoke, Va. The Lumen Bearing Co., Buffalo, is about to extend its plant. Charles H. Birmingham, Munsey building, Baltimore, is about to erect a foundry. The Atlantic Stamping Co., Rochester, N. Y., will extend its capacity. The Dahlstrom Metallic Door Co., Jamestown, N. Y., will erect a large extension. The Union Twist Drill Co., Athol, Mass., is about to erect several additions. The New Departure Mfg. Co., Bristol, Conn., let a contract for the erection of a large addition. George A. Leighton, Manchester, N. H., will erect a new foundry. James Spence, Jersey City, N. Y., will erect an addition to his foundry. The Commercial Acetylene Railway Light & Signal Co., Bound Brook, N. J., is about to extend its capacity.

Chicago Market Steady

MACHINE tool dealers in Chicago are experiencing a steady volume of trade which is most gratifying. Inquiries, followed by sales in many instances, are coming from almost every line of manufacture, and it is difficult to pick out one line which predominates. The demand is for nearly all types of machines. A feature of the local market is the absence of large buying and comparatively little foreign business has been taken. Prices on many lines have been advanced 7 to 15 per cent during October. Milling machines and radial drills are finding ready sale and are difficult to get except for late delivery. Lathes, which could be obtained promptly a short time ago, can not be promised by most dealers until March 1.

Crane Buying Still Features Market in Pittsburgh

AN ACTIVE demand for lifting equipment continues to be the outstanding feature of the Pittsburgh market. The Marshall Foundry Co., Pittsburgh; the Monessen Foundry & Machine Co., Monessen, Pa., and the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., have not yet closed on the cranes previously referred to in these columns. The Standard Seamless Tube Co., Economy, Pa., is negotiating for a 50-ton crane for prompt delivery. Crane builders, with few exceptions, have enough orders on their books to keep their plants operating at maximum capacity well into next year. Machine tool dealers say that domestic inquiries are more active, and considerable business for a miscellaneous line of equipment is pending.

Small Orders Rule Cleveland Market

THERE is little new business of any proportions in the Cleveland machine tool market. A number of inquiries have been received, but for the most part are for single tools or in lots of two or three machines. It is stated that the contract for 1,800 lathes which was noted in the Oct. 26 issue, as pending, was closed by a Cleveland tool builder. The business was taken with the agreement to deliver the entire order in three years. The Morgan Engineering Co., Alliance, O., plans to erect a 60 x 400-foot addition and is said to be in the market for considerable equipment. The Western Reserve Steel Co., Warren, O., is in the market for a positive high-pressure blower.

Boring Mills Take Lead in Cincinnati Market

THE feature of the Cincinnati machine tool market is the demand for boring machines. While these tools found a ready market shortly after the opening of the European war, orders have been more frequent of late, and today almost as many boring machines are being sold as lathes. The English government still has an inquiry out for 100 of these tools. A Cincinnati machine tool builder reports that a Pittsburgh manufacturer wants about 50 lathes ranging in size from 16 inches to 20 inches and will buy in lots of one or two or will contract with one maker, providing delivery can be made within three weeks. The labor trouble in Cincinnati has dwindled away, and all shops are running at capacity. Deliveries are now on a normal basis.

Among New England Factories

BATH, ME.—The Texas Co. plans to erect a dry dock and a steel and glass machine shop.

NORTH ANSON, ME.—The double saw mill of the North Anson Mfg. Co. was damaged by fire to the extent of $65,000.

PORTLAND, ME.—The Pocahontas Fuel Co., Boston will build a 750-foot wharf and coal hoisting tower at Long wharf.

MANCHESTER, N. H.—George A. Leighton, 136 Concord street, has let contract for 2-story, 58 x 80-foot foundry.

BOSTON.—Jacob L. Snyder, 12 Farnham street, Roxbury, is about to erect an addition for light manufacturing.

BOSTON. — E. P. Clark, 153 Causeway street, is about to erect an addition for light manufacturing.

BOSTON.—J. H. & G. L. Atwood Co. has been incorporated to make automobile tires with $50,000 capital by J. Harold Atwood, George L. Atwood and J. Clifford Atwood.

BOSTON.—The F. C. Wales Co. has been incorporated as civil, electrical and mechanical engineer with $10,000 capital by J. T. Donnell, president; Frederick C. Wales, treasurer and R. W. Wales.

CHICOPEE, MASS. — The Fisk Rubber Co. has awarded a contract to Fred T. Ley & Co., Springfield, Mass., for a 125 x 300-foot boiler house to cost $200,000. Five boilers of 760-horsepower each will be installed and provisions made for three additional boilers.

FITCHBURG, MASS.—The Falulah Paper Co. will build a brick, 1-story and basement, 70 x 141-foot addition to its plant on Falulah road, South Fitchburg.

LYNN, MASS.—The Lynn Supply Co. has been incorporated to make shoe machinery with $30,000 capital by Frank S. Dwinnells, Charlotte M. Dwinnells and Hamilton Hay.

LYNN, MASS.—The General Electric Co. has completed plans and is about to start work on 1-story, 100 x 190-foot steel foundry and 1-story, 60 x 310-foot manufacturing addition.

MANSFIELD, MASS.—The New England Drawn Steel Co., incorporated with $250,000 capital, will commence work at once on a large factory which it expects will be in operation in four months.

MEDFORD, MASS.—The Glenwood Works will build a brick and cement, 2-story, 80 x

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150-foot addition to its plant on Amaranth avenue.

NEW BEDFORD, MASS. — The Loom Fixers' union plans to erect a brick, 3-story, 70 x 70-foot building on Purchase street.

SPRINGFIELD, MASS. — The Fiberloid Co. will build a brick, 2-story, 50 x 150-foot machine shop to cost $35,000 on Worcester street, Indian Orchard.

UXBRIDGE, MASS.—The Waucantuck Mills will erect a complete worsted spinning plant in addition to their plant.

WORCESTER, MASS.—The Reed-Prentice Co. will build a 1-story, 50 x 55-foot addition to its building at 94 Gold street for the storage of patterns.

WORCESTER, MASS.—The Washburn & Garfield Mfg. Co. will build a brick, 3-story and basement, 61 x 99-foot light manufacturing building to cost $60,000 at Commercial and North Foster streets.

PAWTUCKET, R. I.—The Dexter Yarn Co. is building a brick, 4-story and basement, 40 x 120-foot addition.

WOONSOCKET, R. I. — Edmond Brodeur & Son, 40 Worrall street, are about to erect 1-story, 60 x 112-foot manufacturing building.

BRIDGEPORT, CONN.—The National Type Foundry has been incorporated with $175,000 capital by William J. Platt, G. S. Platt and Edward E. Atkins.

BRIDGEPORT, CONN.—The New York Smelting & Refining Co. has been incorporated with $100,000 capital by Abraham Rachelson, president; I. Kaspdon, treasurer, and Philip Norvitz, secretary.

BRIDGEPORT, CONN.—The Karm Terminal Co., recently incorporated with $200,000 capital, has purchased property valued at $85,000 and will erect ovens for manufacturing coke and a storage terminal along the water front. The incorporators are R. C. McNeil, Charles J. Mercer and John T. Cooper.

DANBURY, CONN.—New York, New Haven & Hartford railroad has let contract for round house and repair shop here.

HARTFORD, CONN.—The Hall, Thompson Co., 112 Allyn street, is about to erect 3-story, 42 x 100-foot plant.

HARTFORD, CONN.—The Billings & Spencer Co. will build a brick, 2-story, 69 x 115-foot factory building to cost $22,000 at Laurel and Park streets.

MIDDLETOWN, CONN.—The New England Enameling Co. has awarded contract for a brick factory building.

NEW BRITAIN, CONN. — The Beacon-Cadwell Mfg. Co. has awarded to Lewis A. Miller the contract for 6-story concrete factory building, 42 x 110 feet.

NEW HAVEN, CONN. — The Baumann Rubber Co. has awarded to C. W. Burditch the contract for the erection of a $20,000 factory building. The structure will be 32 x 75 feet, 3-story, brick and concrete construction.

WATERBURY, CONN. — The Waterbury Mfg. Co. will erect a 6-story, 62 x 142-foot factory building, with an ell 62 x 147 feet.

WATERBURY, CONN.—The Scoville Mfg. Co. has started work on a brick and steel, 125 x 220-foot and a steel and frame, 50 x 170-foot addition to its plant on Silver street.

From the Alleghenies to the Sea

BROOKLYN.—The Zobel Color Works has been incorporated with $200,000 capital by E. W. Stratmann, W. P. Hamilton Jr., G. R. Foody, 37 Grant Square, Brooklyn.

BROOKLYN.—The Electric Hoist Corporation has been incorporated with $25,000 capital to manufacture motors, tools, engines, derricks, etc., by C. Gass, F. M. Alleva and A. A. Schroeder, 2117 East Fourteenth street.

CARTHAGE, N. Y.—Work has just been started on the erection of a sulphite mill by the Island Paper Co. of this city. The structure will be 2-story, brick and concrete construction, and will cost about $100,000.

CORTLAND, N. Y.—An $8,000, 1-story plant addition, 36 x 96 feet, will be built by the Cortland Corundum Wheel Co. C. H. Riley is in charge.

FLUSHING, L. I.—The Merkel Motor Wheel Co. has been incorporated with $215,000 capital, by L. Schreiber, F. R. Huntington and J. F. Merkel, 284 Washington place.

HUDSON FALLS, N. Y.—The Union Bag & Paper Co. will start work at once on the erection of a 4-story, 100 x 400-foot plant addition. It is understood that the proposed structure will be used exclusively for the manufacture of paper bags.

NEW YORK.—The Ideal Anti-Skid Co. has been incorporated with $125,000 capital, by I. N. Jacobson and H. N. and S. Baruch, 667 West 161st street.

NEW YORK.—The Washed Air Cooling, Heating, Ventilating Co. has been incorporated with $100,000 capital by J. H. Lambert, O. J. Elder and B. MacFadden, 949 Broadway.

NEW YORK.—The Premier Special Machine Co. has been incorporated with $50,000 capital, to manufacture tools, gages, machines, etc. C. A. Davidson, 125 West 115th street, and A. A. Greenberg, 600 Academy street.

NEW YORK.—The United States Alloys Co. has been incorporated with $400,000 capital to manufacture alloys and products, by L. J. Baltzer, G. J. Brigham and B. F. Boetschins, 150 Nassau street.

NEW YORK.—The L. W. F. Engineering Co. has been incorporated with $350,000 capital, to manufacture hydro-aeroplanes, engines and motors, by M. J. Murray, A. H. Flint and J. Osler, 505 Fifth avenue.

PHOENIX, N. Y.—The Sweets Paper Co. is taking sub-bids on the erection of a $13,000, 1-story mill, 60 x 90 feet.

PHOENIX, N. Y.—The Duffy Silk Co. is planning to erect a large modern mill to replace the structure badly damaged by fire recently.

ROCHESTER, N. Y.—The Gleason Tool Works plans to erect a 1-story reinforced concrete addition to its plant on University avenue, to cost $11,000.

ARLINGTON, N. J.—The Standard Tool & Mfg. Co. has been incorporated with $25,000 capital to construct machinery, docks, gas and electric plants, etc., by John Strandberg, Bernard Keating, Arlington, and Frank Roach, Newark.

ELIZABETH, N. J.—F. L. D. Smidth Co., manufacturers of concrete block machinery, announces it will build 85-foot, steel, hollow tile and concrete extension to its machine shop.

ELIZABETH, N. J.—The S. L. Moore & Sons' Corporation has awarded a contract to H. Wilhelms & Son for a 2-story carpenter shop to cost $18,000. The structure will be 60 x 75 feet of reinforced concrete frame with brick curtain walls and reinforced concrete floors. The company is having plans drawn by Ring, Cleaves & Graham for an office building.

NEWARK, N. J.—H. M. Salyer, owner of the Salyer Tool Works, 57 Park street, is building a garage and repair building at Washington and Pearl streets. The building will be 85 x 194 feet and will cost $35,000.

PATERSON, N. J.—The Standard Oil Co. of New Jersey, has started work on the construction of a $100,000 distribution station, with the H. D. Best Contracting Co., New York City, in charge. The company plans to erect nine buildings, the largest of which will be a warehouse, 75 x 100 feet.

ALLEGANY, PA. — The St. Bonventure's college has plans in progress for a power plant and college building, to cost $125,000. The building will be 2-story, 70 x 110 feet. The architects are Mowbray & Uffinger, 56 Liberty street, New York City.

BELLEVUE, PA. — The Young Men's Christian Association plans to erect a building, to cost about $100,000.

CONNELLSVILLE, PA. — The Jimtown Coal Co. has been incorporated with a capital of $6,000; by Paul B. Dick, A. C. Steckle and G. Corrado, Connellsville.

CONNELLSVILLE, PA.—The Pittsburgh & Lake Erie railroad plans to build a line from Connellsville to Darnley, Pa., and from there to West Virginia coal fields. J. A. Atwood, Pittsburgh, is chief engineer.

ERIE, PA.—The Palace Hardware Co., 913 State street, plans to build a warehouse, to cost about $60,000.

ERIE, PA.—The Hammermill Paper Co. plans to erect a 3-story power building, 88 x 116 feet, to cost about $50,000. The Osborn Engineering Co., Engineers building, Cleveland, is the engineer in charge of the work.

ERIE, PA.—The board of education committee on finance and property plans to build the East high school and the Lincoln school, to cost $450,000 and $200,000, respectively. William B. Ittner, St. Louis, is preparing the plans.

IDLEWILD, PA.—The St. Paul's Orphan Asylum plans to build a 3-story addition, 150 x 400 feet, to cost about $250,000. Edward Stotz, Monongahela Bank building, Pittsburgh, is preparing the plans.

JOHNSTOWN, PA.—The Buser Silk Mill plans to build an addition to its factory.

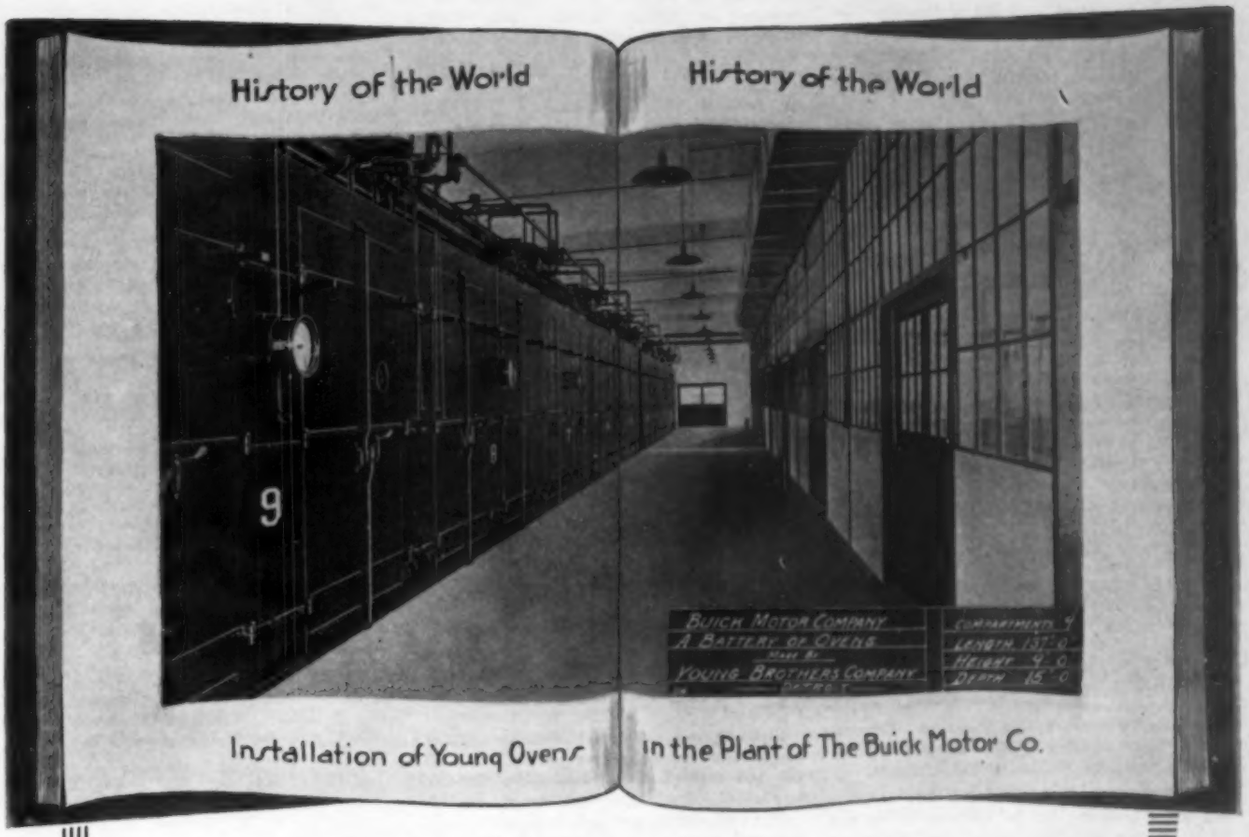
JOHNSTOWN, PA.—The board of education plans to erect a high school, to cost about $200,000. J. E. Adams, Lincoln building, and G. Wild, 734 Main street, are preparing the plans. W. A. Cochran, 605 Central avenue, is president of the board.

MAHAFFEY, PA.—The Mount Airy Coal Co. has been incorporated with $200,000 capital to carry on a general mining and colliery business and to manufacture coke; by F. Mulhollen Miller, Pittsburgh; H. Adlim, MacDonald, N. Y., and Clara T. Leidg, Mahaffey.

MILLVALE, PA.—The plant of the McDowell Mfg. Co., Stanton avenue and Sheridan street, was damaged by fire Oct. 26. The loss is estimated at $100,000.

MILLVALE, O.—The Independent Brewing Co. plans to build a fireproof addition to

Sounds like a Fable, but *IT'S TRUE*



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5. They maintain a constant circulation.
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7. They provide complete combustion.
8. They facilitate production.
9. They minimize production costs.
10. THEY MAXIMIZE RESULTS.

YOUNG BROTHERS COMPANY

Russel and Franklin Streets **Detroit, Michigan**

its plant to cost about $250,000. Bollinger Bros., Fulton building, Pittsburgh, are preparing the plans.

NATRONA, PA. — County commissioners, Pittsburgh, plan to construct a bridge from Natrona to Braeburn.

NEW CASTLE, PA.—County commissioners will receive bids for erecting several bridges in Lawrence county.

NEW CASTLE, PA.—The American High Explosive Co. plans to build a plant to cost about $400,000.

NEW CASTLE, PA.—The Standard Steel Car Co., Mahoning avenue, plans to build an addition to cost about $300,000.

NEW CASTLE.—City council plans to repair South Mill street bridge and later intends to construct a new one with the aid of the Mahoning & Shenango Railway & Light Co. and the county. T. A. Gilkey is county engineer.

OIL CITY, PA.—The Pennsylvania railroad, Allegheny division, plans to eliminate the grade crossing at Oil City.

PHILADELPHIA.—The Ridge Avenue Iron & Metal Co. is taking sub bids for a 1-story machine shop, 68 x 150 feet, to be erected on Clearfield street near Thirtieth street.

PHILADELPHIA.—The Jenkins Interlocking Mfg. Co. has been incorporated with a capital of $5,000; by F. C. Holberg Jr., Jennie A. Jenkins and Thomas W. Jenkins, Philadelphia.

PITTSBURGH. — The Passavant hospital, Reed and Miller streets, will build an addition, to cost about $100,000.

PITTSBURGH. — The Arbogast Machine Co. has been incorporated with a capital of $5,000; by R. S. Geise, C. V. Arbogast and F. W. Stonecipher, all of Pittsburgh.

PITTSBURGH. — The Monongahela Connecting railroad plans to build a 1-story, steel machine shop and will make repairs to its roundhouse on Second avenue, to cost $16,500.

PITTSBURGH.—The Pittsburgh Brewing Co. plans to build a 2-story addition to its brewery on Liberty avenue, near Oxford street, to cost $47,000.

PITTSBURGH.—The city will soon award contracts for piping and appurtenances for the Brilliant pumping station, to cost about $30,000.

PITTSBURGH.—The Atlantic Refining Co. plans to erect a 13-story building, with a tower of four additional stories, on Grant boulevard and Strawberry Way, to cost about $1,000,000.

PITTSBURGH.—The East End Christian church will erect an edifice on Shady avenue and Howe street, to cost about $150,000. Janssen & Abbott, Century building, are preparing the plans.

PITTSBURGH. — The Pittsburgh Visible Spark Plug Mfg. Co. has been incorporated with a capital of $50,000 to manufacture spark plugs by William Boyd Winloft and Charles H. Jones, of Wilmington, Del.

PITTSBURGH.—The Pennsylvania railroad has awarded W. F. Trimble & Son, 1719 Pennsylvania avenue, a contract for a 1-story warehouse, 25 x 200 feet, to cost about $16,000.

PITTSBURGH.—The D. L. Clark Co. plans to build two 6-story additions, 27 x 65 feet and 62 x 120 feet, respectively, to its plant, to cost about $125,000. P. Dietz, House building, is preparing the plans.

PITTSBURGH.—The Canton Oxygen & Hydrogen Co. has been incorporated with a capital of $200,000 to manufacture oxygen, hydrogen and chemicals; by Frank H. McCarthy, Charles W. Meily and John H. Haverty, all of Pittsburgh.

ROCHESTER, PA. — The Pennsylvania Lines West of Pittsburgh plans to construct a 200-foot bridge over the Beaver river, including two steel spans, double-track, etc. T. Rodd, Pittsburgh, is the engineer in charge of the work.

UNIONTOWN, PA.—Fayette county plans to construct a bridge over the Monongahela river between Fayette City and Allenport, to cost about $200,000.

YORK, PA.—The board of education plans to erect a school, to cost about $40,000. R. E. Stair Jr., Guardian Trust building, and E. Leber, Hay building, are preparing the plans.

WILMINGTON, DEL.—The Concrete Ship & Barge Co. has been incorporated with $500,000 capital to build, construct, equip and operate ships, by H. T. Latter, N. P. Coffin, C. M. Egler, of Wilmington.

WASHINGTON.—Sealed proposals will be received by the bureau of standards, department of commerce, until Nov. 15, for one ½-ton cupola, blower, ladle and other accessories. Specifications may be had on application to the bureau.

Activities in the Central States

ALLIANCE, O.—The city will soon receive bids on a pumping station and clear water basin for waterworks. Chester & Fleming, Union Bank building, Pittsburgh, are the engineers in charge of the work.

BELLEFONTAINE, O.—The city is having plans prepared for an addition to its gas plant to cost $50,000. Some new equipment will be purchased.

BELLEFONTAINE, O.—Plans are being prepared for an improvement to the water works system to cost $15,000. Some new equipment will be purchased. Address C. A. Inskeep, director of public service.

CANTON, O.—W. C. Schick, clerk of the board of commissioners, Stark county, will open bids Nov. 1 for the repairing of a number of bridges. Plans are on file with the county surveyor.

CINCINNATI.—The Conejos Rubber Co. has been incorporated with $100,000 capital, by E. D. Woodward, C. F. Albrecht, M. P. Holland, et al.

CINCINNATI.—Werner & Atkins, architects, Mercantile Library building, are preparing plans for a $50,000 garage, 50 x 151 feet, for the American Rolling Mills Co., Middletown, O.

CLEVELAND.—The American Ship Building Co. plans to erect a $20,000 addition to the building at 5310 Crescent avenue.

CLEVELAND.—Engineers W. C. Owen & Co. have plans and will close bids Nov. 4 for the erection of a power plant and water works station for the city of East Palestine.

CLEVELAND.—The Triangle Seal & Cap Co. has been incorporated with $100,000 capital, by A. A. Templin, R. S. Manus, R. J. Diebold, et al.

CLEVELAND.—The P. & W. Machine & Engineering Co. has been incorporated with $10,000 capital, by H. E. Plitz, W. T. Black, E. Parle, et al.

CLEVELAND.—National Artificial Silk Co. has applied for a building permit for a $55,000 power block to be located at 9801 Walford road.

CLEVELAND.—W. W. Hodges, architect, Schofield building, is preparing plans for a factory building for James H. Rook, 508 Williamson building. The building will cost $200,000.

CLEVELAND.—The W. S. Ferguson Co., 1900 Euclid avenue, is preparing plans for a factory building for the Columbia Axle Co., W. R. Hopkins, president. The new building will be 1 and 2-story, 300 x 500 feet and will cost $250,000.

CLEVELAND. — The Mechanics Laundry Co., T. A. Schulkins manager, will erect a 2-story building, 54 x 130 feet. Richards & Yost, architects, Rockefeller building, are preparing plans for the structure which will be built at East Forty-fifth and Lexington avenue, at a cost of $15,000.

COLUMBUS, O.—The Cincinnati Mfg. Co. has closed negotiations for a location for the metal door manufacturing department of the Kinnear-Jager Mfg. Co. which will be added to its holdings.

COLUMBUS, O.—C. E. Slater, engineer, 503 Chamber of Commerce building, is preparing plans for repairs to the electric lighting plant of London, O. A converting station to change power from a single to a three-phase system, to cost $25,000, will be erected.

COLUMBUS, O.—Stribling & Lum, architects, are preparing plans for the Columbus Mill & Mine Supply Co. for a new combination warehouse and structural steel fabricating plant, to be erected on Marion road. The building will be fireproof, one and two story, 150 x 225 feet.

COSHOCTON, O.—The Hanley Plow Co., T. J. Hanley, manager, will rebuild its plant which was damaged by fire to the extent of $40,000.

CUYAHOGA FALLS, O.—The Meyer Rubber Co. has been incorporated with $100,000 capital by F. W. Hachtel, P. D. Tresh, and E. L. Mallory.

DAYTON, O.—Architects Theis & Theis are reported to be in the market for estimates on the new $175,000 Fenwick Club, which will be erected on Pioneer street.

DAYTON, O.—The Duiron Co., P. D. Schenck manager, has purchased 12 acres on which it intends to erect a factory building. The company at present is operating the shop formerly owned by the Dayton Globe Iron Works. Plans for the new building have not been prepared as yet.

GREENVILLE, O.—The plant of C. L. Crandall, Dayton, O., has been damaged by fire to the extent of $20,000.

HILLARDS, O. — A school building to cost $40,000 will be erected here. Bids will be received by the board of education about Nov. 15.

KENMORE, O.—A school building to cost $60,000 will be erected here, the dimensions are 2-story, 72 x 132 feet.

LIMA, O.—A school building three stories and basement to cost $400,000 will be erected by the board of education. Plans are in progress.

LONDON, O.—The city will build an addition to its electric plant to cost $25,000. The plant will be changed from single phase to three phase, and some new equipment will be purchased. Plans are being prepared.

MIDDLETOWN, O.—The saw mill of C. W. Boyd & Co., at North Bend, O., was damaged by fire to the extent of $25,000.

MIDDLETOWN, O.—Plans are being prepared for a public garage 50 x 151 feet, to cost $50,000, to be erected by the American Rolling Mill Co. A small amount of light equipment will be needed.

NEWARK, O.—The Newark Stamping & Foundry Co. soon will start an addition to its foundry. The new building will be 50 x 100 feet and will be used as a foundry for handling gray iron castings for electrical machinery.

RAVENNA, O.—A turbo-generator set to cost $50,000 will be purchased for the filtration plant at this place, by W. H. Linton, director public service. A steel storage tank with the capacity of 3,000,000 gallons is being considered.

SANDUSKY, O.—The Continental Rubber Co., J. J. Duck president, will erect a 2-story, basement and sub-basement, 50 x 300-foot factory which will cost $50,000. H. G. Millott, architect, Bliss building, will have the plans ready after Nov. 1.

SPRINGFIELD, O.—The Springfield Baking Co. has purchased a site on Columbia street on which a new baking plant will be erected.

STEUBENVILLE, O. — City officials and the Pennsylvania railroad plan to construct a bridge and trestle over Sixth avenue. The city council also plans to build two other bridges to be known as the C. & P. and No. 43. J. N. Leech is the city engineer.

WARREN, O.—Plans are being made to double the capacity of the lamp division of the West Side Electric Works.

YOUNGSTOWN, O.—The Carnegie Steel Co. will award soon the contract for equipment and machines for the new McDonald mill. Other contracts have been awarded.

YOUNGSTOWN, O.—The Ohio State Telephone Co. plans to build extensions, to cost about $410,000. George G. King is local manager of the company.

CHARLESTON, W. VA. — Kelly's Creek railroad plans to construct a 7-mile railroad from Cedar Grove, Kanawha county, up the valley of Kelly's Creek. The company was recently incorporated with a capital of $10,000.

FAIRMONT, W. VA. — The Monongahela Valley Traction Co. plans to extend the Western line through Stealey Heights street. E. B. Moore is general manager of the company.

KENOVA, W. VA.—The Basic Products Co., Pittsburgh, plans to improve and enlarge its plant with about $250,000.

MANNINGTON, W. VA.—The Blackshere Oil & Gas Co. has been incorporated with a capital of $500,000, to operate in Marion county.

MOUNDSVILLE, W. VA.—The Ohio Valley Sand & Slag Co. has been incorporated with a capital of $15,000. The company's chief works are at Chestnut Hill, Marshall county.

WHEELING, W. VA.—The General Baking Co., McColloch street, plans to build a bakery, to cost about $60,000.

WHEELING, W. VA.—The B. & O. railroad will begin work Nov. 1 on a new $35,000 freight station. Plans for the structure have been approved by the president of the company.

WHEELING, W. VA. — The Hazel-Atlas Glass Co. plans to erect a 3-story addition to its plant at Nineteenth and Jacob streets, to cost about $50,000. C. W. Bates is preparing the plans.

FAIRMOUNT, IND.—The Bell Mfg. Co. has been incorporated with $50,000 capital to manufacture machinery, by H. Abrams, W. J. Henley and J. W. Joseph.

INDIANAPOLIS. — The Atkins Mfg. Co. has been incorporated with $50,000 capital, to manufacture heaters. Among the directors are D. W. Atkins, A. O. Atkins and Leslie Genung.

NEW ALBANY, IND.—R. H. Reynolds & Co., are erecting an automobile woodstock plant, combining two factories now at Corydon and DePauw, Ind.

SOUTH BEND, IND. — The Kendallville Mfg. Co. will erect an 82½ x 132-foot addition at the corner of Main and Garst streets. The addition will cost approximately $10,000.

CHICAGO.—The Accurate Engineering Co. will build a 1-story forge shop 133 x 266 feet, costing $20,000.

CHICAGO.—The Bosch Magneto Co., 119 East Twenty-fourth street, will build a plant costing $18,000.

CHICAGO. — The Regan Can Co., 322 South Michigan avenue, will build a 1-story shop 60 x 200 feet on Carondelet avenue, costing $12,000.

CHICAGO.—The Boss Nut Co. is building a 1-story addition 75 x 150 feet and 35 x 115 feet at its plant, 1744 North Kolmar avenue, at a cost of $25,000.

DECATUR, ILL. — The Wabash Railroad Co. is planning to erect a steel shop building at Decatur. A. O. Cunningham, Railway Exchange building, St. Louis, is chief engineer.

LINCOLN, ILL.—Logan county commissioners will ask bids soon on a steel and concrete bridge 85 feet long, 18-foot roadway over Kickapoo creek. T. S. Davy is county superintendent of highways.

METROPOLIS, ILL.—The Wilson Stove & Mfg. Co. has been incorporated with $100,000 capital by S. H. Long, James Wilson and J. B. Wilson.

MOLINE, ILL.—The Moline Forging Co. will erect a plant on land recently purchased in this city. The company will be reorganized with additional capital and will manufacture heavy forgings, electric cranes, etc. The company has been using the plant of Williams, White & Co.

BIG RAPIDS, MICH. — The Four Drive Tractor Co. has increased its capital from $50,000 to $200,000 and will enlarge its plant.

DETROIT.—The Detroit Bearing & Casting Co. will build an addition to its plant at 75 West Baltimore avenue.

DETROIT.—The Martin Radiator Co. has been incorporated with $25,000 capital, by William Martin, M. J. McCarthy, et al.

DETROIT.—The Burroughs Adding Machine Co. will build a 5-story factory 65 x 70 feet. Albert Kahn is architect.

DETROIT. — The Metalwood Mfg. Co., manufacturer of high speed machinery, and valves, is building an addition and installing equipment. W. R. Keen is secretary.

DETROIT. — The Detroit Closed Bushing Co. has been incorporated with $15,000 capital to manufacture electrical and mechanical devices, by H. E. Watson, F. H. Hydon, William Short, et al.

GRAND HAVEN, MICH. — The Keller Pneumatic Tool Co. is having plans made by Wernette, Bradfield & Mead, architects, Grand Rapids, for a factory 104 x 240 feet.

GRAND RAPIDS, MICH.—Wernette, Bradfield & Mead are preparing plans for a factory building for the Keller Pneumatic Tool Co., Grand Haven, Mich. The building will be 1-story, 104 x 240 feet, mill type construction.

HANCOCK, MICH. — The Acme Garage Co., West Quincy street, owned by Seppi Bros., will build a new fireproof building to cost about $12,000.

HOLLAND, MICH. — The Western Tool Works, N. Bosch, manager, plans to build a large addition which will double the capacity of the plant.

MANISTEE, MICH.—The Manistee Iron Co. has announced intentions of installing $25,000 worth of new machinery. The company manufactures pumps similar to those used on motor fire-fighting apparatus.

MONROE, MICH.—The Swift Mfg. Co., manufacturer of magnetos, will build a plant at Monroe.

TRAVERSE CITY, MICH.—A school building 80 x 136 feet to cost $100,000 will be erected by the board of education. Plans are completed and bids will be taken soon.

WYANDOTTE, MICH.—The McCord Mfg. Co., manufacturer of automobile parts, will build an addition.

BELOIT, WIS.—The P. F. Mork Foundry Co. is building an addition 50 x 150 feet, with cupola and crane.

CUDAHY, WIS.—The Ladish-Obenberger Drop Forge Co. will build an addition 50 x 200 feet, 1-story, brick and steel.

LA CROSSE, WIS.—Two sets of plans have been completed and are now under consideration by the common council, for the erection of a new bridge over Black river, at Clinton street, to replace the present drawbridge. The plan prepared by George Bradish, city engineer, calls for a steel draw-span, with frame approaches, costing $50,000. The plan made by W. C. Buetow, bridge engineer, state highway commission, contemplates an all-steel bridge, with structural approaches, costing about $5,000 additional. A decision will be made soon. A. A. Bentley is mayor.

MANITOWOC, WIS. — The Aluminum Goods Mfg. Co. will build a 3-story addition, 100 x 250 feet.

MILWAUKEE.—The Evinrude Motor Co. will build a 2-story addition.

MILWAUKEE.—The Wrought Washer Mfg. Co., 54-58 South Bay street, has been granted a permit to build a large fireproof warehouse, one story and basement, 90 x 331 feet costing $20,000.

MILWAUKEE.—The Maynard Steel Foundry Co., 716 Reed street, has completed plans for a fireproof addition, 1-story, 80 x 100 feet. The work is in charge of Architect Charles J. Keller, Germania building, who will take bids after Oct. 28.

MILWAUKEE — An ordinance is being considered by the common council which would require the use of iron or steel reinforcements and piling in all openings made in improved streets in the city. The idea is to reinforce excavations to prevent crumbling, settling, and damage to pavements.

MILWAUKEE.—Plans for extensive additions to the works of the Pressed Steel Tank Co., Milwaukee, at Fifty-seventh and National avenues, in West Allis, are rapidly being completed. Contracts already have been let for the preliminary grading and excavation work, and it is expected that construction awards will be made before Nov. 1.

MILWAUKEE.—Smith, Garden & Martin architects, 104 South Michigan avenue, Chicago, have been instructed by the trustees of Columbia hospital, Milwaukee, to rush plans to completion for the first unit of the proposed new $400,000 hospital group at Maryland and Hartford avenues. The trustees have set aside $100,000 for the first unit. F. L. Sivyer, 385 Lake drive, is chairman.

SOUTH MILWAUKEE, WIS.—The Stowell Co. will build a core room 40 x 70 feet, two stories.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to Jan. 1, 1917; higher to July 1, 1917.)

Bessemer valley	$26.00
Bessemer, Pittsburgh	26.95
Basic, Pittsburgh	22.95 to 23.95
Basic, eastern Pa.	21.50 to 22.00
Basic, Buffalo	24.00 to 25.00
Malleable, Pittsburgh	23.95
Malleable foundry, Chicago	22.00 to 23.00
Malleable foundry, Philadelphia	23.00 to 23.50
Malleable foundry, Buffalo	24.00 to 25.00
No. 1X foundry, Philadelphia	23.00 to 23.50
No. 2 foundry, Pittsburgh	23.95
No. 2 foundry, Cleveland	23.30 to 23.80
No. 2 foundry, Ironton	21.00
No. 2 foundry, Chicago	22.00 to 23.00
No. 2X foundry, Philadelphia	22.50 to 23.00
No. 2X foundry, N. J. tidewater	22.50 to 23.00
No. 2X foundry, Buffalo	24.00 to 25.00
No. 2 plain, Philadelphia	22.00 to 22.50
No. 2 plain, N. J. tidewater	22.00 to 22.50
No. 2 plain, Buffalo	24.00 to 25.00
No. 2 southern, Birmingham	17.00 to 17.50
No. 2 southern, Cleveland	21.00 to 21.50
No. 2 southern, Chicago	21.00
No. 2 southern, Phila. delivery	20.00 to 20.75
No. 2 southern, Cleveland	23.30
No. 2 southern, New York docks	20.00 to 20.50
No. 2 southern, Boston docks	20.25 to 20.75
No. 2 south. interior, New Eng.	20.50 to 21.50
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	20.00 to 20.50
Virginia, No. 2X, Philadelphia	22.75 to 23.25
Virginia, No. 2X, Jersey City	23.00 to 23.50
Virginia 2X, Boston points	23.25 to 23.75
Gray forge, eastern Pa.	20.00 to 20.50
Gray forge, Pittsburgh	22.95
Gray forge, Birmingham	14.00
Silveries, 8 per cent, furnace	27.00 to 30.00
Silveries, 8 per cent, Chicago	29.50 to 30.50
Low phos. Standard, Phila.	40.00 to 42.00
Low phos. Lebanon, Pa., furnace	35.00 to 37.00
Low phos., Pittsburgh	40.00 to 41.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	20.75 to 22.75
Charcoal, Buffalo	24.00 to 27.00
Charcoal, Birmingham	22.50 to 23.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton.	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.
(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit	8.5c to 8.9c
Local N. Y. and N. J. ores, unit	9.0c to 9.50c
Port Henry lump, at mines, ton.	$4.00

Foreign Ores.
(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	nominal
For'n non-Bess., 50 to 65 per cent	nominal

COKE

(At the ovens.)

Connellsville furnace	$7.00 to 7.50
Connellsville fur., contract	3.75 to 4.00
Connellsville foundry, contract	5.00 to 5.50
Connellsville foundry	8.00 to 8.25
Wise county furnace, contract	4.00 to 5.00
Wise county foundry, contract	5.00 to 6.00
Pocahontas foundry, contract	5.00 to 6.00
Pocahontas furnace, contract	4.00 to 5.00
New River foundry, contract	5.50 to 7.00
New River furnace, contract	4.50 to 5.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, or delivered prompt.	$162 to 165
Ferro manganese, 80 per cent, seaboard, or delivered, contract	162 to 165
Spiegel, 20 per cent, fur. early and last half	40.00 to 45.00
Ferro-silicon, 50 per cent, Pbg.	95.00 to 100.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $32.00; 10 to 11 per cent, $32.00; 11 to 12 per cent, $34.00; 12 to 13 per cent, $35.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$50.00 to 55.00
Forging billets, Phila.	65.00 to 70.00
Forging billets, Pbgh., nominal.	65.00 to 70.00
Forging billets, Chicago	65.00
Wire rods, Pittsburgh (nom.)	60.00 to 65.00
Bessemer billets, Youngstown	50.00
Bessemer billets, Pittsburgh	50.00
Open hearth billets, Pittsburgh.	50.00
Open hearth billets, Youngstown	50.00
Bess. sheet bars, Youngstown	50.00
Op. h'th sheet bars, Youngstown	50.00
Bess. sheet bars, Pittsburgh	50.00
Open hearth sheet bars, Pbgh.	50.00
Muck bars, Pittsburgh (nominal)	45.00

SKELP

Grooved steel skelp	2.60c to 2.70c
Sheared steel skelp	3.00c to 3.25c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bess. rails, Pbgh & Chgo.	$33.00
Stan. op-h'th rails, Pbg & Chgo.	35.00
Light rails, 8 to 10 lbs., Pbgh.	50.00
Light rails, 8 lb., Chicago	43.00
Light rails, 12 to 14 lbs., Pbgh.	49.00
Light rails, 12 lbs., Chicago	42.00
Light rails, 16 to 20 lbs., Pbgh.	48.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York, (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Chgo.	$41.00
Light rails, 25 to 45 lbs., Pbgh.	47.00
Light rails, 25 to 45 lbs., Chgo.	40.00
Relaying rails, standard, Pbgh. and Chicago	$23.00 to 24.00
Relaying rails light, Chicago	24.00 to 25.00
Angle bars, st. sect., Pbgh. base	2.00c to 2.50c
Angle bars, st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	2.65c to 2.75c
Spikes, railroad, Chicago	2.75c to 2.90c
Track bolts, Pittsburgh	3.25c to 3.50c
Track bolts, Chicago	4.00c to 4.50c
Tie plates, Chicago	50.00 to 55.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	2.80c
Structural shapes, Pbgh.	2.85c
Structural shapes, Philadelphia	2.959c to 3.009c
Structural shapes, Chgo.	2.89c to 3.50c
Structural shapes, New York	2.869c to 3.019c
Tank plates, Chgo.	3.19c to 3.60c
Tank plates, Pittsburgh (con.)	3.25c to 3.50c
Tank plates, Pbgh.	3.50c to 4.00c
Tank plates, Philadelphia	3.659c to 4.159c
Tank plates, New York	3.669c to 4.169c
Bars, soft steel, Chicago	2.79c to 3.50c
Bars, soft steel, Pbgh. (con.)	2.70c to 2.80c
Bars, soft steel, Pbgh.	2.85c
Bars, soft steel, New York	2.869c to 3.019c
Bars, soft steel, Philadelphia	2.859c to 3.009c
Hoops, carloads, Pittsburgh	3.25c
Bands, Pittsburgh	2.70c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chgo.	2.45c to 2.50c
Bar iron, Philadelphia	2.559c to 2.659c
Bar iron, Cleveland	2.55c
Bar iron, New York	2.569c to 2.669c
Bar iron, Pittsburgh	2.65c to 2.75c
Hard Bess. steel bars, Chgo.	2.50c

SHEETS

(In cents per pound.)
(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	3.20
22 to 24	3.25
25 and 26	3.30
27	3.35
28	3.40
29	3.45
30	3.55

TIN MILL BLACK

Gage.	Bessemer.
15 and 16	3.20
17 to 21	3.25
22 to 24	3.30
25 to 27	3.35
28	3.40
29 and 30	3.45
30½ and 31	3.50

GALVANIZED.

Gage.	Bessemer.
10 and 11	3.85 to 4.00
12 to 14	3.95 to 4.10
15 and 16	4.10 to 4.25
17 to 21	4.25 to 4.40
22 to 24	4.40 to 4.55
25 and 26	4.55 to 4.70
27	4.70 to 4.85
28	4.85 to 5.00
29	5.05 to 5.20
30	5.25 to 5.40

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	3.50
9 to 10	3.25
11 to 12	3.25
13 and 14	3.10
15 and 16	3.15

No. 28, black, Chicago	3.69c
No. 28 galvanized, Chicago	5.19c
No. 10, blue annealed, Phila.	3.419c
No. 10, blue annealed, Chgo.	3.44c to 3.69c

TIN PLATE

Tin plate, 100 lb., coke base	5.75c to 6.00c
Terne plate	4.90c

IRON AND STEEL PIPE

(Prices Adopted July 24, 1916.)

Steel.

Butt weld:—	Black.	Galv.
⅛, ¼ and ⅜ in.	62	35½
½ in.	66	51½
¾ to 3 in.	69	55½
Lap weld:—		
2 in,	63	50½
2½ to 6 in.	66	53½
7 to 12 in.	63	49½
13 and 14 in.	53½	..
15 in.	51	..

Iron.

Butt weld:—	Black.	Galv.
⅛ and ¼ in.	51	24
⅜ in.	52	25
½ in.	56	38
¾ to 1½ in.	59	43
Lap weld:—		
1¼ in.	46	31
1½ in.	52	38
2 in.	53	39
2½ to 4 in.	55	42
4½ to 6 in.	55	42
7 to 12 in.	54	41

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	54
Iron, 3½ to 4½ inches, l. c. l.	44

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted Oct. 19, 1916.)
(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.70
Plain wire, jobbers', Pittsburgh	2.65
Galvanized wire, jobbers', Pbgh	3.35
Polished staples, Pbgh	2.85
Galvanized staples, Pbgh	3.55
Barb wire, painted, jobbers', Pbgh.	2.85
Barb wire, galv., jobbers', Pbgh	3.55

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ¾ x 6 inches, smaller or shorter, rolled thread, 50 and 5, cut threads, 40, 10 and 2½, larger or longer, 35 and 2½.

Machine bolts with hot pressed nuts ¾ x 4 inches, smaller or shorter rolled 50, and 10; cut, 50; larger or longer, 40 and 5.

Cold pressed, semi-finished hexagon nuts, 60 and 5.

Gimlet and cone point lag bolts, 50 and 10. Hot pressed square, blank or tapped nuts, $2.70 off list; hot pressed hexagon blank or tapped, $2.70.

Cold pressed square, blank or tapped, $2.40 off; hexagon, blank or tapped, all sizes, $2.80.

RIVETS

Structural rivets, Pbgh	4.00c
Structural rivets, Chgo. delivery	4.25c
Boiler rivets, Pbgh	4.10c
Boiler rivets, Chgo. delivery	4.35c

Tinner's rivets, 45, 10 and 5 off, Pittsburgh.

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.60c to 2.70c

STANDARD STEEL CHAIN

Chain, ¾ inch proof coil	5.00c to 5.50c

COLD ROLLED STRIP STEEL

Base price 6.25c to 6.50c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$34.50 to 35.00
Six-inch and larger, Chicago	31.50 to 32.00
Six-inch Class B, New York	32.50
Four-inch Class B, New York	35.50
Four and six-inch Birmingham	29.00
Six-inch and larger, Birmingham	26.00

Leight weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.25c
Steel squares, 2-in. & ov., Cleve.	3.90c
Steel rounds, 2-in. & ov., Cleve.	3.90c
Steel bars, under 2 in., Cleveland	3.40c
Steel bars, Detroit	3.25c
Steel bars, Philadelphia	3.25c
Steel bars, New York	3.35c
Steel bars, St. Louis	3.30c
Steel bars, Cincinnati	3.35c to 3.90c
Steel bars, St. Paul	3.38c
Steel bars, over 2-in., Buffalo	4.20c
Steel bars, Buffalo	3.35c
Iron bars, Chicago	3.10c
Iron bars, Cleveland	3.35c
Iron bars, Detroit	3.20c to 3.25c
Iron bars, St. Louis	3.20c to 3.25c
Iron bars, Cincinnati	3.35c to 3.90c
Iron bars, Philadelphia	3.25c
Iron bars, New York	3.35c
Shapes, Chicago	3.25c
Shapes, Detroit	3.25c
Shapes, St. Louis	3.30c
Shapes, St. Paul	3.35c
Shapes, New York	3.35c
Shapes, Cleveland	3.40c
Shapes, Philadelphia	3.25c
Shapes, Buffalo	3.35c
Shapes and plates, Cincinnati	3.35c to 3.75c
Plates, Chicago	3.75c
Plates, Detroit	3.75c to 4.00c
Plates, St. Louis	3.80c
Plates, St. Paul	3.85c
Plates, New York	4.25c to 4.50c
Plates, Cleveland	3.80c
Plates, Philadelphia	4.00c to 4.50c
No. 10 blue anl. sheets, Chicago	3.50c
No. 10 blue anl. sheets, Cleve.	3.70c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. L.	3.55c
No. 10 blue anl. sheets, Cinci.	3.50c
No. 10 blue anl. sheets, St. Paul	3.60c
No. 10 blue anl. sheets, Detroit	3.55c
No. 28 black sheets, Chicago	3.55c
No. 28 black sheets, Cleveland	3.50c
No. 28 black sheets, Cincinnati	3.75c
No. 28 black sheets, Detroit	3.40c to 3.50c
No. 28 black sheets, St. Louis	3.70c to 4.00c
No. 28 black sheets, St. Paul	3.65c
No. 28 galv. sheets, Chicago	4.65c to 4.75c
No. 28 galv. sheets, Cleveland	5.00c
No. 28 galv. sheets, Cincinnati	4.50c to 5.00c
No. 28 galv. sheets, Detroit	5.00c
No. 28 galv. sheets, St. Louis	5.30c to 5.40c
Hoops, Cleveland	4.00c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$21.25 to 21.75
Angle bars, steel, St. Louis	16.50 to 17.00
Arch bars and transoms, Chgo.	24.50 to 25.00
Arch bars and transoms, St. L.	24.00 to 24.50
Boiler plate, cut, No. 1, Chgo.	10.50 to 11.00
Boiler plate, cut, No. 1, St. L.	11.50 to 12.00
Boiler punchings, Chicago	13.50 to 14.00
Bundled sheet, Cincinnati	8.75 to 9.25
Busheling, No. 1, Chicago	15.50 to 16.00
Busheling, No. 1, Cincinnati	12.75 to 13.25
Busheling, No. 1, Cleveland	14.50 to 14.75
Busheling, No. 1, St. Louis	14.50 to 15.00
Busheling, No. 2, Chicago	10.50 to 11.00
Cast borings, Chicago	7.25 to 7.75
Cast borings, Cincinnati	4.75 to 5.25
Cast borings, Cleveland	6.75 to 7.00
Cast borings, St. Louis	6.25 to 6.50
Cast, No. 1, Chicago	14.50 to 15.00
Cast, No. 1, Cincinnati	12.50 to 13.00
Cast, No. 1, Cleveland	14.25 to 14.75
Cast, No. 1, St. Louis	13.50 to 14.00

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	18.00 to 18.50
Iron axles, St. Louis	33.50 to 34.00
Iron axles, Cleve	37.00 to 38.00
Knuckles, coup., Chicago	18.00 to 18.50
Knuckles, coup., St. Louis	18.00 to 18.50
Locomotive tires, Chicago	25.50 to 26.00
Locomotive tires, St. Louis	23.50 to 24.00
Machine shop turnings, Chgo	6.00 to 6.50
Machine shop turnings, Cleve	5.50
Machine shop turn'gs, Cincinnati	5.25 to 5.75
Machine shop turnings, St. L.	6.25 to 6.50
Malleable agricultural, Chgo.	11.00 to 11.50
Malleable agricultural, St. Louis	12.50 to 13.00
Malleable, Cincinnati	9.00 to 9.50
Malleable railroad, Chicago	14.25 to 14.75
Malleable railroad, St. Louis	13.00 to 13.50
Pipes and flues, Cleveland	13.00 to 13.25
Pipes and flues, Chgo.	13.75 to 14.25
Pipes and flues, St. Louis	13.50 to 14.00
Railroad wrought, No. 1, Chgo.	18.75 to 19.25
Railroad wrought, No. 1, Cleve.	18.50 to 19.50
Railroad wrought, No. 1, St. L.	18.50 to 19.00
Railroad wrought, No. 1, Cinci.	15.00 to 15.50
Railroad wrought, No. 2, Chgo.	18.00 to 18.50
Railroad wrought, No. 2, St. L.	17.75 to 18.00
Shafting, St. Louis	23.00 to 23.50
Springs, Chicago	18.50 to 19.00
Steel car axles, St. Louis	37.00 to 38.00
Steel car axles, Chicago	37.00 to 38.00
Stove plate, Chicago	11.25 to 11.75
Stove plate, Cleveland	11.00 to 11.50
Stove plate, Buffalo	12.00 to 12.50
Stove plate, Cincinnati	8.50 to 9.00
Stove plates, St. Louis	12.00

(Gross tons.)

Axle turnings, Cleveland	$11.25 to 11.50
Busheling, No. 1, Buffalo	14.00 to 14.50
Busheling, No. 1, Pittsburgh	14.75 to 15.25
Busheling, No. 2, Buffalo	11.50 to 12.00
Bundled sheets, Pittsburgh	13.00 to 13.25
Bundled sheets, Cleveland	11.25 to 11.50
Bundled sheets, Buffalo	11.50 to 12.00
Car wheels, (iron), Pittsburgh	15.50 to 16.00
Car wheels (steel), Pittsburgh	19.00 to 19.50
Car wheels, Chicago	14.50 to 15.00
Car wheels, eastern Pa.	16.50 to 17.00
Car wheels, Buffalo	15.50 to 16.00
Car wheels, New York	14.50 to 15.00
Car wheels, St. Louis	13.50 to 14.00
Car wheels, Birmingham	10.50 to 11.00
Tram car wheels, B'ham	9.50 to 10.00
Cast borings, New York	7.50 to 7.75
Cast borings, eastern Pa.	10.50 to 11.00
Cast borings, Buffalo	8.00 to 8.25
Cast borings, Pittsburgh	9.00 to 9.25
Cast, No. 1, eastern Pa.	16.75 to 17.25
Cast, No. 1, Pittsburgh	15.50 to 16.00
Cast, No. 1, Birmingham	11.00 to 11.50
Cast, heavy No. 1, N. J. points	16.00 to 16.50
Forge, No. 1, eastern Pa.	12.50 to 13.00
Frogs, switches, guards, St. L.	19.00 to 19.50
Grate bars, Buffalo	13.00 to 13.50
Grate bars, N. J. points	12.00 to 12.25
Heavy axle turnings, Buffalo	12.00
Heavy melting steel, Pittsburgh	18.75 to 19.25
Heavy melting steel, Buffalo	18.25 to 18.75
Heavy melting steel, Chicago	17.50 to 18.00
Heavy melting steel, Cleveland	17.75 to 18.00
Heavy melting steel, Cincinnati	16.00 to 16.50
Heavy melting steel, eastern Pa.	16.50 to 17.00
Heavy melting steel, New York	15.00 to 15.50
Heavy melting steel, St. L.	19.50 to 20.00
Heavy melting steel, B'ham	11.00 to 11.50
Iron rails, Chgo	22.50 to 23.00
Iron rails, Buffalo	20.50 to 21.00
Iron rails, Cincinnati	19.00 to 19.50
Iron rails, St. Louis	21.50 to 22.00
Iron rails, Cleveland	22.00
Iron axles, Pittsburgh	35.00 to 36.00
Iron axles, Cincinnati	24.50 to 25.00
Iron axles, eastern Pa.	30.00 to 32.00
Iron axles, Chicago	35.00 to 36.00
Iron axles, Buffalo	34.00
Low phos. steel, Buffalo	24.00 to 25.00
Low phos. steel, Pittsburgh	22.00 to 23.00
Low phos. steel, eastern Pa.	22.50 to 23.50
Machine shop turnings, Buffalo	7.00 to 7.50
Mch. shop turnings, New York	7.00 to 7.50
Mch. shop turnings, Pittsburgh	7.75 to 8.25
Mch. shop turnings, eastern Pa.	9.00 to 9.50
Mch. shop turnings, Birmingham	6.50 to 7.00
Malleable railroad, Cleveland	17.50 to 17.75
Malleable railroad, Buffalo	15.50 to 16.00
Malleable railroad, Pittsburgh	15.75 to 16.00
Malleable railroad, eastern Pa.	13.00 to 14.00
R. R. and mch. cast, No. 1 Bfl.	17.50 to 18.00
R. R. wrought, No. 1, Buffalo	20.50 to 21.00
R. R. wrgt., No. 1, eastern Pa.	23.00 to 23.50
City wrought, New York	15.00 to 15.50
R. R. wrought, No. 1, Pbgh.	19.50 to 20.00
R. R. wrought, No. 1, B'ham	12.00 to 12.50
Reroll. rails, 5 ft. and ov., Pbgh.	20.00 to 21.00
Reroll. rails, 5 ft. & ov., Chgo.	21.50 to 22.00
Reroll. rails, 5 ft. & ov., E. Pa.	20.50 to 21.00
Reroll. rails, 5 ft. & ov., St. L.	21.50 to 22.00
Shafting, New York	19.50 to 20.00
Shafting, eastern Pa.	22.00 to 22.50
Shoveling steel, Chicago	16.50 to 17.00
Shoveling steel, St. Louis	18.00 to 18.50
Steel rails, short, Chicago	19.50 to 20.00
Steel rails, short, Cleveland	21.00
Steel rails, over 6 ft. Cleveland	19.00 to 19.50
Steel rails, old, B'ham	12.00 to 12.50
Steel rails, short, St. Louis	20.50 to 21.00
Steel car axles, Birmingham	26.00 to 27.00
Steel car axles, New York	32.00 to 33.00
Steel car axles, Buffalo	34.00
Steel car axles, Cleveland	40.00 to 41.00
Steel car axles, Pittsburgh	35.00 to 36.00
Steel car axles, eastern Pa.	30.00 to 32.00
Stove plate, N. J. points	12.25 to 12.75
Stove plate, Birmingham	9.00 to 9.25
Stove plate, Pittsburgh	11.75 to 12.00
Stove plate, eastern Pa.	14.00 to 14.50
Wrought pipe, New York	13.75 to 14.00
Wrought pipe, eastern Pa.	16.00 to 16.50
Wrought pipe, Buffalo	13.50 to 14.00

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Mesta Machine Co., Pittsburgh, Pa.
Tod, Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

ACCUMULATORS. (Hydraulic.)
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.

ACETYLENE IN CYLINDERS.
Linde Air Products Co., New York City.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

AEROPLANE WIRE, STRAND AND CORD.
Roebling's, John A., Sons Co., Trenton, N. J.

ALLOYS.
American Vanadium Co., Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Steel Co., Canton, O.

ALUMINUM. (Granulated.)
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM. (Solder.)
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM. (Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

ALUMINUM ALLOYS.
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM INGOTS.
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM RODS. (Sheet.)
United Smelt'g & Alum. Co., New Haven, Ct.

ANGLES, TEES, CHANNELS.
(See Steel, Structural.)

ANNEALING BOXES AND POTS.
Blackwood Steel Fdy. Co., The, Springfield, O.
Mesta Machine Co., Pittsburgh, Pa.
Pittsburgh Annealing Box Co., Pittsburgh, Pa.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
Swedish Crucible Steel Co., Detroit, Mich.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ANTIMONY.
Wah-Chang Mining & Smelting Co., New York City.

ANTIMONY OXIDES.
Wah-Chang Mining & Smelting Co., New York City.

ARCHITECTURAL SHAPES.
Empire Art Metal Co., College Pt., N. Y.

ARMATURES.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

ASH BUCKETS.
Lakewood Engrg. Co., Cleveland, O.

AXLES.
American Bridge Co., New York City.
American Steel Export Co., New York City.
Bethlehem Steel Co., So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

BABBITT METAL.
Keystone Bronze Co., Pittsburgh, Pa.
Lubricating Metal Co., The, New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.

BAKERS, WIRE COATING.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALLS. (Steel.)
Bethlehem Steel Co., The, So. Bethlehem, Pa.
New Departure Mfg. Co., Bristol, Conn.

BANDS. (Steel.)
Carnegie Steel Co., Pittsburgh, Pa.

BARGES. (Steel.)
American Bridge Co., New York City.

BARRELS, TUMBLING. (Wire Nails.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARS—ALLOY.
Central Steel Co., The, Massillon, O.

BARS. (Concrete Reinforcing.)
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS. (Iron and Steel.)
American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Steel Co., Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.

BEAMS, CHANNELS AND ANGLES.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS. (Ball.)
New Departure Mfg. Co., Bristol, Conn.

BEARINGS. (Vanadium Steel.)
American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.
Williams, I. B., & Sons, Dover, N. H.

BELT LACING. (Leather.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTING. (Chain.)
Link-Belt Company, Chicago, Ill.

BELTING—LEATHER.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BENCHES. (Steel.)
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES. (Drawing.)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL, RECOVERY PLANTS.
Koppers, H., Co., Pittsburgh, Pa.

BILLETS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
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Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Portsmouth Works, Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BINS. (Steel.)
Empire Art Metal Co., College Pt., N. Y.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE TUYERES.
Keystone Bronze Co., Pittsburgh, Pa.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLOCKS. (Chain.)
Yale & Towne Mfg. Co., New York City.

BLOOMS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Hillman, J. H., & Sons, Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

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